

ANNALS
OF
OTOLOGY, RHINOLOGY
AND
LARYNGOLOGY.

VOL. XVIII. SEPTEMBER, 1909. No. 3.

XXXII.

PROGRESS OF LARYNGOLOGY AND RHINOLOGY
SINCE THE INVENTION OF THE LARYNGO-
SCOPE, WITH SPECIAL REFERENCE TO
THE PARTICIPATION OF AMERICA
IN THIS PROGRESS.

BY JOHN SENDZIAK,

WARSAW (POLAND).

*Mr. President and Fellows of the American Academy of Oph-
thalmology and Oto-Laryngology:*

It is first my pleasant duty to express to you my sincerest thanks for the great honor of inviting me to come to America and deliver an address at this meeting.

I have accepted this invitation with greater willingness in that it gives me the opportunity, as a representative of the Polish nation, of expressing my gratefulness to your great country which has so generously and appreciatingly recognized the merits of my countrymen, Kosciuzko and Pulaski, who

*An address delivered before the American Academy of Ophthalmology and Oto-Laryngology, at the meeting in New York City, October 4 to 6, 1909.

joined in the fight for its freedom. And I feel thankful too for your country's hospitality and generosity towards my people who are forced by grievous conditions to seek in another hemisphere means of earning their daily bread.

Before passing to the subject proper of my address, the development of laryngology and rhinology since the invention of the laryngoscope, with special reference to the participation of America in this development, allow me to honor the memory of the distinguished representatives of our specialty in America who have been called away by the common foe from their great activity. I shall mention here only the names of Elsberg, a pioneer in American laryngology; O'Dwyer, Morgan, Hooper, Jarvis, Thorner, Mulhall, Lincoln, Daly, Asch, Dickerman, Glasgow, Shadle, etc., all of whom have achieved a permanent place in laryngologic literature.

Let me, also, as a representative of European laryngo-rhinology, salute the great body of our fraternity in America, among the most eminent of whom are those who are here assembled.

In preparing the paper which was written for the fifty-year jubilee of the invention of the laryngoscope, and published in the *Centralblatt f. Laryngologie* last year, upon the development of laryngology and rhinology in the individual countries, I was struck by the uncommon strength and number of the papers written by our American colleagues.

It is sufficient to state that one-third of all the literature on laryngology and oto-laryngology comes from America.

It is worthy of note that here in New York where this meeting takes place, the first general laryngological society was founded in 1873, more than thirty-five years ago. The first German society, however, was organized in 1877, four years later, as the oto-laryngological section of the Association of German Naturalists and Physicians. In other countries, such societies were founded much later.

In general, oto-laryngology and ophthalmology, often associated together, did not attain the recognition in any European country as in America.

Already in 1861, soon after the invention of the laryngoscope, the great Elsberg, who died alas too soon, was teaching his specialty in the New York University. Since that time special chairs of oto-laryngology have been established in all the American universities, more than one hundred in number.

In this regard and with respect to special hospitals devoted to oto-laryngology and ophthalmology, old Europe remains considerably behind her younger sister.

There are quite a number of special oto-laryngologic journals (six) in America, about one-sixth of all publications of this character. It is worthy of note that the *Archives of Laryngology* was established in New York in 1880, nearly thirty years ago. It was unfortunately only continued for three years. Only two European journals were founded before this, the *Monatsschrift für Ohrenheilkunde, etc.*, in Germany in 1867, and the *Annales des Maladies des Oreilles, etc.*, in France in 1875.

The tremendous development of American laryngo-rhinology is strikingly shown in the immense number of papers published, 13,000, more than one-fourth of those in the literature of laryngo-rhinology during the past twenty-five years. In this respect America occupies the first place among the nations of the world.

Of these, about 1300 of the American publications are general in character; there are fifteen manuals of laryngology, rhinology and otology, about one-sixth of the total of such publications.

Several of those have passed through a number of editions, testifying to their value, for instance, Solis Cohen, Seiler, Sajous, Bosworth, Coakley, Braden Kyle (four editions of this excellent treatise have been published). One of the first treatises on diseases of the upper-air passages was published in America, that of Horace Green, in 1840, in prelaryngoscope days. The first was published in Germany in 1829, by Albert of Bonn. One of the best histories of laryngology came from the pen of your very distinguished fellow-citizen, Jonathan Wright.

The exceedingly important relation between laryngo-rhinology and general medicine, to which attention was called first by Loeri of Buda-Pesth in 1885, and later by Friedrich of Leipzig, and Semon of London, has been the subject of many valuable papers by Americans, viz., Goodale, Goldsmith, Freudenthal, Johnston, Mayer, Simpson, Harris, Stucky, Levy, Stein, Bryant and many others who have discussed the relation of diseases of ear, nose and throat to nervous and mental diseases, rheumatism, gout, diabetes mellitus, lues, tuberculosis and diseases of the digestive and circulatory sys-

tems. All but Simpson came to the conclusion that a causal relation undoubtedly exists between them.

The relation between diseases of the nose, especially those of the accessory sinuses, and the eye, to which attention was called in Europe by Ziem, Jonas, Onodi, etc., has been, of late, carefully studied by American specialists: Pierce, Cutler, Griffin, Holmes, Hoople, Murphy, Johnston, Halstead, Pooley, Hastings, Posey, Brawley and Loeb (anatomic research). Flatau and Gutzman in Germany have written many special articles on the voice and its culture and speech defects; in America, Hudson Makuen, Scripture, Miller, Solis Cohen, Holbrook Curtis and many others.

In the realm of anatomy, histology, pathologic anatomy, bacteriology and physiology of the upper-air tract, in which Zuckerkandl, Onodi and Hajek in Austria, B. Fraenkel, Kuttner, Heymann and Klemperer in Germany, Semon and Horsley in England, Dmochowski in Poland and Broeckaert in Holland have distinguished themselves, I may mention the very valuable papers, in America, of Loeb, Ingersoll, Bryson, Delavan, Holmes, Wood, Ballenger, Jonathan Wright, Pierce, Hooper and many others.

I pass on to the methods of examination of the upper-air passages. As an auxiliary to laryngoscopy, which was introduced more than fifty years ago by Garcia, Tuerck and Czermak, there have been added a number of methods, especially autoscropy by Kirstein of Germany, high and low tracheoscopy (this latter was first applied by my compatriot, Prof. Pieniazek of Cracow), bronchoscopy, the famous work of Killian of Freiburg, esophagoscopy (Stoerk in Austria, Mikulicz in Poland, Hacker and Rosenheim in Germany), transillumination of the accessory nasal cavities (Vohsen of Frankfurt on the Main and my compatriot, Heryng) and radio-scopy, the application of the Roentgen rays, minutely described at the first international congress of laryngology at Vienna by Burger of Amsterdam, Ferreri of Rome, Gradenigo of Turin and Killian of Freiburg.

All of these methods have been described in detail in America. Above all, Chevalier Jackson, of Pittsburg, who wrote an excellent monograph, the first in English, on tracheo-bronchoscopy, esophagoscopy, and gastroscopy, then Halstead, Chisholm, etc. French brought photography into the service of laryngology, Beck stereoscopy and stereopticon color photography and Bleyer the phonograph.

Levy made studies of the newer diagnostic methods, such as tests for tuberculosis (ophthalmoreaction of Calmette) and the Wasserman reaction for syphilis (Smithies, etc.).

Passing on to the remedies and therapeutic methods which have enriched our field since the advent of laryngoscopy, partly collected in the excellent pharmacopea of Lefferts (2d edition, 1885), I must in the first place cite cocaine (eucain, alypin, etc.), introduced in 1884 to laryngology by Jellinek of Vienna. The introduction of the specific serum simultaneously by Roux of Paris and Behring of Berlin, was of the greatest importance in the treatment of diphtheria, as well as the use of intubation in laryngeal diphtheria, which was the contribution of the eminent American physician, O'Dwyer.

Phototherapy (sunlight, ultra violet rays, Finsen's method), Roentgen rays and radium, the latest discovered by my compatriot, Skłodowska (Currie) of Paris, have been utilized for different diseases of the upper-air passages, especially lupus and malignant disease; likewise electricity, galvanocautery and electrolysis have been utilized in Europe (Gradenigo, Ferreri, etc.) and in America (Freudenthal, Scheppegrell and many others).

Solis Cohen has written an excellent monograph on inhalations, the principal exponent of which in Europe is Heryng of Warsaw.

Other methods which have been tried in minute detail in America are paraffin injections, first applied by Gersuny of Vienna, for malformations of the nose (*nez de mouton*, etc.) and Bier's hyperemia, regarding which there is still difference of opinion. The former is sometimes dangerous (cases of sudden blindness, Semon, Davis, Smith).

Among the most important remedies applied with more or less success in diseases of the upper-air passages, I must mention orthoform, introduced as a therapeutic agent for laryngeal tuberculosis by the distinguished American specialist, Freudenthal, and adrenalin for making nasal operations almost bloodless.

Many of the new or modified instruments for the diagnosis and treatment of diseases of the upper-air passages were invented by Americans: Jarvis (snare), Bosworth (saw), Richards, Curtis, Allen, Pierce, Stein, Beck, Ballenger, Freer, etc.

Rhinology, a younger sister of laryngology, has shown a remarkable development during the past twenty-five years,

especially with reference to the accessory sinuses. The literature comprehends more than 11,000 papers or publications, about one-fourth of the entire laryngo-rhinologic literature, of which 4500 or 40 per cent are American. The investigations of Thomson and Hewlett of England, of Wurtz and Lermoyez of France, and Schousbone of Denmark, showed that the healthy nasal secretions are free from bacteria and possess bactericidal properties. As to the cause of atrophic rhinitis some authors in America, such as Rice, regard it as due to a special organism (Loewenberg-Abel diplococcus), while others, for instance the well-known specialist Kyle, do not.

Beck among others in America opposes Grünwald's theory of the simultaneous causal connection between atrophic rhinitis and affections of the accessory nasal cavities. As to the treatment of this obstinate disease most of the writers in America, for instance Richards, are pessimistic. On the contrary, Brown of Triest, and Laker of Graz consider vibratory massage as most efficacious (Weightman in America), but the method has not come into general use. The same thing applies to electrolysis by Belgian authors (Cheval, etc.) and antidiphtheritic serum by Italian writers (Belfanti, Della Vedova, etc.).

Hypertrophies of the turbinates are best treated with galvanocautery, less so by resection. Stucky in America is not favorable to operations on the middle turbinate, a view with which I concur.

Deviations of the nasal septum have of late been made the subject of many papers in America, by Jackson, Ballenger, Swain, Rhodes, Hurd, Sheedy, etc. Killian in Europe and Freer in America almost simultaneously devised the submucous resection operation, now generally adopted.

Braden Kyle proposes the V shaped resection and Price Brown the H shaped. (This latter is simply a modification of Asch's well-known method.) Beck has recently written a valuable paper on the surgery of the external deformities of the nose. Freudenthal has, among others in America, contributed a paper on bleeding from the nose, Gleitsmann, Mosher and Thrasher on tuberculosis, Donelan, Lincoln and John Mackenzie on syphilis and Jonathan Wright, Cobb, Levy, Price Brown, Wishart, etc., on malignant neoplasms.

As to the so-called reflex neuroses of nasal origin (asthma, hay fever, headaches, cough, enuresis nocturna, epilepsy, etc.)

it should be stated that since Hack's publications appeared the boundless enthusiasm has given way to a more rational opinion to the effect that there is undoubtedly a causal relation which, however, is by no means so frequent as certain writers such as Jonas in Germany still maintain; at that, sometimes, but not so very frequently, the removal of the cause by appropriate surgical operation on the nose is followed by the disappearance of the nervous symptoms. Wendell Phillips of New York, on the contrary, is somewhat skeptical of this point.

It should be mentioned that more recent publications suggest new methods of treatment of asthma by bronchoscopy (Nowotny from the clinic of Pieniazek in Cracow), and of hay fever by serum (Loeb), by submucous injections of alcohol (our esteemed President Stein) and by immunization (Curtis).

In the main, it should be stated that in recent literature the abuse of nasal operations may be noted, to which Semon justly drew attention in Europe and John Mackenzie in America. This pertains especially to the use of the galvanocautery, the resection of the turbinates and operations on the nasal septum.

Above all, the development of our knowledge of the accessory nasal cavities and their pathologic process has been marvellous during the past twenty-five years. Beginning with Ziem's clinical investigations on the antrum of Highmore and the anatomic research of Zuckerkandl, the subject has been carried forward by such men as Killian, Grünwald, Gerber and Uffenorde of Germany, Hajek and Onodi of Austria and Oppikofer of Basel, all authors of the newest and most exhaustive monographs on the subject.

In America there have been many valuable papers written on the subject, anatomic and physiologic by Loeb, Chisholm and Ingersoll, clinical by Lothrop, Coffin, Myles, Coakley, Cobb, Richards, Ingals, Jackson, Curtis, Roe, Holmes, Theisen, Ballenger, Kyle, de Roaldes, Johnston (empyema) and by Gleitsman (tuberculosis).

In general, it may be stated that skiagraphy occupies the final position in the transillumination of the accessory cavities for diagnostic purposes.

So far as the nasopharynx is concerned the greatest attention during the past twenty-five years has been devoted to the so-called adenoid vegetations, although the pathologic condi-

tion had been described in 1868, more than forty years ago, by the Danish otologist, Wilhelm Meyer, in honor of whom the laryngologic world erected a monument in his native town, Copenhagen.

One of the best monographs on the subject was written by Gradenigo of Turin. Many valuable papers have been published in America, among others, by Braden Kyle, Paz, de Roaldes, Legurd, Richards, as well as Freer, who proposes the operation through the nose, an old method suggested by the father of adenoids vegetations, now generally abandoned in Europe for Gottstein's or Beckmann's curettes, applied through the mouth, without general narcosis (except in England).

Roy has written a paper on Tornwaldt's disease, bursitis nasopharyngealis, and Makuen on nasopharyngeal tumors.

The oral and pharyngeal cavities have been made the subject of many papers during the past twenty-five years—about 13,000, of which 3,500, more than one-fourth, have come from America. Among these are the anatomic as well as physiologic papers of the distinguished American specialists, Wood, Pierce, Ballenger, etc.

The nature of the so-called follicular angina and its relation to diphtheria have been the subject of many papers. Most of the writers (B. Fraenkel, myself and others) on bacteriologic grounds regard it as an independent pathologic process having nothing in common with true diphtheria, staphylococci, streptococci and pseudodiphtheritic bacilli being constantly found in follicular angina. De Roaldes and Ward have written, among others, on this point.

An enormous literature exists upon diphtheria and its treatment with the Roux-Behring antidiphtheritic serum, both in Europe and America, about 6,000 papers, of which 1,500, one-fourth, are from America.

The results are generally favorable—for instance Martin in America reports only 9.7 per cent of deaths. The treatment of croup by intubation, now adopted in Europe, is of everlasting credit to the American physician, O'Dwyer.

Cobb, Fitzwilliams, Holmes and others have written on tonsillar, peritonsillar and retropharyngeal abscess. Chevalier Jackson advises tonsillectomy instead of tonsillotomy, for hypertrophied faucial tonsils, an opinion with which Richards concurs. It is, however, difficult to agree with this view.

Hypertrophy of the lingual tonsil, to which attention has been drawn in Europe only in more recent times (Michael's of Hamburg excellent monograph), has been discussed by many writers in America, Gleitsmann, Oppenheimer, etc.

Vincent's angina, but lately described as due to the bacillus fusiformis (Plaut-Vincent), has been described among others by Buhlig in America, but the pathologic process itself requires still further investigation. The same requirement exists for the pneumococcus infection of the throat described recently by Semon.

Bryson Delavan, Newcomb and Chevalier Jackson in America have written on tonsillar and peritonsillar bleeding.

Myles, Gibb, Mayer, etc., have written on diseases of the salivary ducts and glands and Stein and Shoemaker on leucoplakia buccalis.

Many of our American colleagues (Richardson, Brown Kelly, Braden Kyle and Wood) have written on mycosis, tonsillaris benigna, a disease described under this term for the first time by B. Fraenkel of Berlin in 1873, and afterwards by Heryng of Warsaw (mycosis leptothricia pharyngis). They all adhere to Siebenmann's theory that it is not a proper mycosis, but a hyperkeratosis of the epithelium, the leptothrix buccalis being only accidental. With reference to the so-called black tongue (lingua nigra) which some authors, especially in Poland, Cionglinski, Hewelke and myself, as well as Schmiegelow of Copenhagen, hold to be mycosis (mucor niger, the cause), Johnston and others in America regard it as hyperkeratosis of the lingual papillae.

Robertson, Gleitsmann, Johnston, Levy, Mosher and Danziger have contributed papers on tuberculosis of the oral cavity and pharynx, Bulkley on extragenital syphilis (syphilis in the innocent, 1894) and Goodale, Ross, Freer, Goldstein, etc., on malignant disease.

Tremendous development is shown in our knowledge of the larynx and trachea. The total number of papers reaches about 10,500, of which America has contributed 2,500, almost one-fourth.

Our understanding has attained the highest efficiency in two of the pathologic processes, thanks to the laryngoscope, tuberculosis and malignant tumors of the larynx. Both had been regarded as incurable, as something in nature "noli me tangere." In the first place Moritz Schmidt of Germany in the

year 1880 and Heryng of Poland in 1886 proved that laryngeal tuberculosis, a most frequent disease (affecting about one-third of all cases of pulmonary tuberculosis), is undoubtedly curable and that the rational treatment of the disease is surgical. I must say, however, that the enthusiasm in this respect was later greatly diminished (Semon, Schroetter, Chiari in Europe and Jonathan Wright, Robinson, White, Pierce, Casselberry, etc., in America).

It is noteworthy, however, that Bryson Delavan in America already in 1875 wrote an excellent monograph on laryngeal tuberculosis and that Gleitsmann of New York is one of the most earnest enthusiasts in presenting the matter at the international congresses.

Lactic acid, introduced by Krause of Berlin in 1885, has had its advocates up to the present time (Heryng in Europe, White, Coakley, etc., in America).

I appreciate most highly the orthoform treatment of laryngeal tuberculosis recommended first by Freudenthal and applied successfully by Stein, White, etc., especially in cases of dysphagia (best, per se).

Attention, very justly I think, is being drawn to absolute silence as a best curative agent in these cases, especially when combined with climatic treatment in sanatoria. (Semon in Europe and Levy and Freudenthal in America.)

Until we find a specific remedy for the cure of pulmonary tuberculosis, it will be rather fruitless to speak of the radical cure of laryngeal tuberculosis, an opinion which I expressed already in 1889 in my monograph on this subject (*Jour. of Laryn.*).

As to the relation of pregnancy to laryngeal tuberculosis, Freudenthal and others in America agree with Kuttner of Berlin, that artificial abortion is indicated in such cases.

I pass now to the second important disease, cancer of the larynx, which has become a living question, particularly since the time of the German Emperor, Frederick III.

Before Billroth's time, cancer was likewise considered in the light of "noli me tangere."

With the first laryngectomy performed in 1873 by Billroth, begins the rational, i. e., surgical, treatment of this disease.

It should be stated that in 1864, soon after the introduction of the laryngoscope, the efforts in this direction were made by Elsberg in America, the author of the excellent monograph,

"Laryngeal Surgery in the Treatment of Laryngeal Tumors," by the endolaryngeal route, the method later spread abroad, especially by B. Fraenkel of Berlin. The first two laryngotomies (laryngo-fissure) were performed by American physicians, Buck in 1851 and Sands in 1863. This method is now regarded as the most efficacious in the treatment of the disease, thanks particularly to Semon of London.

It must also be stated that the first lasting result (twenty years recovery) was attained by this method by the Nestor of American laryngologists, Solis Cohen; the best general results being those of Semon of London (80 per cent recoveries) and Chevalier Jackson of Pittsburg (78 per cent).

In my paper prepared for the First International Laryngological Congress, held in Vienna in 1908, entitled "Die Frage der Radikalbehandlung des Larynxkrebs in den letzten 50 Jahren" (1858-1908), I succeeded in collecting from the literature, a tremendous number of cases of laryngeal cancer operated on by the different methods, namely, 1,002. I stated that laryngofissure gave the best results, about 50 per cent of recoveries, endolaryngeal methods 46 per cent, presenting, however, much less security as to relapses, partial laryngectomy 22.8 per cent, and total laryngectomy, 21.6 per cent. The best results from laryngectomy, total and partial, were obtained by von Bergman and Gluck in Germany, Kocher in Bern, Novaro in Turin, Cisneros in Madrid, and Solis Cohen and Hartley in America.

In the main, laryngotomy (laryngofissure) has the greatest number of adherents, including besides Semon and Jackson, already mentioned, von Bruns of Tübingen, Pieniazek of Cracow, Chiari of Vienna, Moure of Bordeaux, and Schmiegelow of Copenhagen.

In addition to Jackson, Bryson Delavan has written in a pessimistic vein upon the subject, and also Stein, Watson, John Mackenzie, etc.

Edematous processes involving the larynx (laryngitis submucosa acuta, erysipelas and abscessus laryngis) have been subjected to considerable elaboration, especially by Kuttner of Berlin in 1895, Massei of Naples in 1885, Hajek of Vienna, 1898-1900, and Semon of London, 1890-1895. The last authority regards acute laryngeal edema or laryngitis submucosa acuta, Massei's erysipelas of the larynx, Senator's acute infectious phlegmon, and angina Ludovici as identical processes, i. e., acute septic infections of the pharynx and larynx.

The American authors who have written on this subject include Pierce on laryngeal phlegmon, and Richardson. Bryson Delavan, among others in America, has written on laryngitis hypoglottica acuta, an affection of the cricoarytenoid articulation, to which Semon drew attention in 1880.

The stenotic processes of the larynx, so admirably described by my compatriot, Pieniazek, have been considered in many valuable papers in America, among others, Price Brown, Fisher and Rogers. Knight, Miller, Casselberry and many others have written upon the etiology, pathology and treatment of vocal nodules (chorditis cantorum), to which Chiari drew attention in Europe.

Roy and Parker advise tracheotomy and thyrotomy in the treatment of papilloma in children. Most European specialists, with Rosenberg of Berlin at the head, favor intralaryngeal operations in such cases.

The greatest progress in our work has been in the domain of nervous diseases of the larynx. This includes the discovery of the phonatory and respiratory centers of the larynx by Krause of Berlin in 1889, and by the English writers Semon and Horsley in 1890, and Risien Russel in 1895, the so-called Semon's law (properly Rosenbach-Semon's) as to the greater vulnerability of the abductors of the larynx in organic paralysis, although the cause of this and of unilateral cortical paralysis is not as yet determined, and the origin of the motor nerve of the larynx, which most authors now believe to be in the nucleus of the vagus.

To the names already quoted of those who have distinguished themselves in this field must be added those of Onodi of Buda-Pesth, Klemperer and Grabower of Germany, Hooper of America, Masini of Italy, and the youngest Broeckaert of Holland.

Recurrent and abductor paralysis was made the subject of discussion at the annual meeting of the American Laryngological Association in 1908 by Gleitsmann, Bryson Delavan, Casselberry and Clarence Rice.

The laryngeal disturbances (paralyses in tabes dorsalis) so minutely described by Burger of Amsterdam, as well as by myself (*Klin. Vortraege. a. d. Geb. d. Otol., etc.*, 1899) have been considered in many papers by American writers, Stein, Freudenthal, Freer, Friedberg, etc. Coolidge has written upon foreign bodies in the larynx, and Emil Mayer of New

York upon scleroma, so well described by the Europeans, Schroetter, Stoerk, Juffinger in Austria, Pieniazek and Baurowicz in Poland, and Gerber in Germany.

The diagnosis and treatment of diseases of the trachea and bronchi has also shown great development in the last few years. In this connection, I must mention the new method of tracheo-bronchoscopy introduced by Killian of Freiburg, which permits of the removal of foreign bodies from the trachea as well as from the bronchi. The excellent monograph by the very distinguished American specialist Chevalier Jackson is especially noteworthy in this regard. In addition to this, Newcomb has written an excellent paper on the anomalies, hemorrhage, inflammation and infections of the trachea, Theisen on tumors, Simpson on stenoses, and Coolidge and Mayer on foreign bodies.

Three thousand papers have been published on the thyroid gland during the past twenty-five years, of which more than 700 (about one-fourth) come from America.

Semon of London showed (1883-1884) that the so-called Kocher's cachexia strumipriva seu thyreopriva and the myxedema of the English writers, cretinism and tetany occurred as the result of one and the same pathologic cause, the suspension of the function of the thyroid gland, and Horsley, also of London, proved that these conditions could be successfully treated by thyroid preparations (thyreoidin), which gave the basis for the organic treatment of this disease.

Sajous of Philadelphia has lately written (1908) on the adreno-thyroid center (glandula pituitaria). Tuholske, also of America, has lately drawn attention to the importance of the parathyroid gland (after its extirpation tetany and death result). Halstead and Richards have also written upon this subject. Wilson, Barker, Stengel, Halstead and Solis Cohen have discussed exophthalmic goitre. The last is not inclined to favor the surgical treatment of the disease; however, Kocher's clinic in Bern showed good results, $3\frac{1}{2}$ per cent of deaths and 83 per cent recoveries. Crile's (America) are not so good—6 per cent of deaths. At any rate the older methods of treating goitre by parenchymatous injections of tincture of iodine and iron are almost entirely abandoned, the surgical treatment being regarded as the most rational one.

Barker adds a fourth symptom to the trinity of symptoms of this disease, exophthalmus, goitre and palpitation of the

heart, viz., muscular tremor. He maintains that tachycardia and exophthalmus are wanting in one-third of the cases. Lesnon has written on the thymus.

The literature of the esophagus and its diseases is relatively small, 1,700 papers, of which America provides 500, nearly one-third. Still much progress can be noted in the more recent times, especially along the line of esophagoscopy and gastroscopy, in which regard there is in America one of the leading exponents, Chevalier Jackson. This method and the application of the Roentgen rays have given the greatest aid to the diagnosis and treatment of certain conditions of the esophagus, foreign bodies, diverticula and neoplasms.

Myer, Mersbach, Halstead, Guizez have written in America on esophagoscopy, Lange on Roentgen ray examination, Schroeder and Ruth Adams on stenosis, Lercher and Huber on dilatations, Farlow on spasms, and Elsner, Seelig and many others on carcinoma.

Mr. President and Fellows of the American Academy of Ophthalmology and Oto-Laryngology: In this short and therefore inadequate resumé, I have endeavored to show the enormous development of our specialty, laryngo-rhinology and otology, since the discovery of the laryngoscope, especially, however, during the past twenty-five years. We have seen that America has taken an important part in this development. Allow me, therefore, as a representative of European laryngology, in conclusion, to express to the progressive medical profession of America my sincere wishes for the continued fruitfulness and greater glory of our specialty.

VIVAT, CRESCAT, FLOREAT OTO-LARYNGOLOGIA ET OPHTHALMOLOGIA AMERICANA.

XXXIII.

NASAL OBSTRUCTION: EXPERIMENTAL STUDY
OF ITS EFFECTS UPON THE RESPIRATORY
ORGANS AND THE GENERAL SYSTEM.*

BY WILLIS S. ANDERSON, M. D.,

DETROIT.

The object sought in the experiments outlined in this paper is to determine what effect, if any, follows the complete or partial closure of the nostrils of animals. Guinea pigs, rabbits and dogs are the animals employed. Two methods of closure of the nostrils have been used: First, cotton and colodion; second, denuding the surface and suturing, while the animal was under ether. The first method is applicable to small animals, where it is desired to close one or both nostrils for not to exceed three or four days; the second method, for all work upon dogs, and upon rabbits and guinea pigs where prolonged closure is desired.

There are certain anatomic differences between the throats of animals and man that ought to be considered. The nose, throat, larynx and trachea are more nearly on a straight line in the lower animals. The larynx is placed higher in the throat, and the epiglottis is readily seen in the dog and rabbit by holding the mouth open. The most important difference, from the standpoint of my experiments, is the relation between the soft palate and the epiglottis.

The soft palate of the guinea pig (Fig. 1) forms a curtain which completely separates the buccal from the nasopharyngeal cavity. This muscular curtain is perforated by a small opening, which is closed in the passive state. The opening of the larynx, with its rudimentary epiglottis, is directly behind the perforation in the soft palate. It is evident that during the act of swallowing this sphincter like opening in the soft

*Read before the American Laryngological, Rhinological and Otolological Society at Atlantic City, June, 1909.

palate relaxes, and the base of the tongue, which has a raised surface, presses the food through the opening. When the nose is entirely obstructed swallowing is necessary in order to get air into the respiratory passages.

The soft palate of the rabbit (Fig. 2) forms a curtain similar to that of the guinea pig, but the opening into the nasopharynx is larger. The epiglottis is well developed, lies in front of the soft palate and covers the opening connecting the buccal with the nasopharyngeal cavity. The relations of these structures in the dog more nearly approaches to that of man (Fig. 3). The curtain of the soft palate is not complete, as in the guinea pig and rabbit; the epiglottis is large and projects up in front of the soft palate. Except when the dog swallows there does not seem to be normally any communication between the buccal and the nasopharyngeal cavities. When the nostrils are closed, and the dog is compelled to breathe through the mouth, the current of air apparently passes through slits on either side of the epiglottis, but there is little evidence to show that normally mouth breathing is practiced.

Very early in my experiments certain changes were found in the lungs of the rabbits and pigs. The question arose whether the changes were due to interference with breathing, or whether the ordinary laboratory animal had frequently pathologic conditions in the lungs. In order to ascertain these points I examined the lungs of fifty guinea pigs supposed to be normal. Macroscopic examination showed one positively diseased, and several others with small abnormal areas. Microscopic examination of a small number showed the lungs to be regularly normal. I do not doubt if a number of sections were made from each lung, and carefully studied, the proportion of diseased lungs would be increased, but from the standpoint of my experiments, the changes regularly found in the lungs, following closure of the nose, cannot be attributed to preexisting disease.

Rabbits have frequently a catarrhal discharge from the nostrils, accompanied by changes in the lungs. Such animals were not used except as mentioned. The examination of a small number of lungs showed that a larger proportion were diseased than in the case of pigs, but the conditions observed were not comparable with the regular changes found in the animals experimented upon.

The observations upon animals with artificially obstructed nostrils will be considered in the following order: First, the

effect upon guinea pigs and rabbits; second, the more extended observations upon dogs; third, the histologic changes; and fourth, an attempt will be made to correlate the facts obtained, and to draw such deductions as seem warranted.

The effects upon guinea pigs when both nostrils are closed are shown in Table 1. Those that lived over 48 hours breathed some through the nose. This is notably so in numbers 2, 3, 8, 19, 22, 23, 24 and 137. It is exceptional for a pig to live more than 36 hours with the nostrils tightly closed. Distention of the abdomen, due to swallowing the air, is noticeable, and frequently becomes marked within an hour after closure. This peculiar gulping in of the air is made necessary by the relation of the soft palate as mentioned above. The distention is more marked when the intestines are filled with food, and can be lessened by fasting the animal. It seems to be a contributory cause of death, but not the essential factor, as in some instances the pigs died quickly without distention. Pig number 25 died within two hours after both nostrils were closed, and the stomach was found to be ruptured. Number 27 also died within two hours, but the abdomen was not markedly distended, nor was the stomach ruptured.

The effect upon guinea pigs with one nostril closed is illustrated in Table 2. Of the 15 pigs twelve had the right side closed and three had the left side. Two lived eight months with one side entirely closed. (Numbers 1 and 9.) Two died within 12 hours. (Numbers 66 and 67.) Probably the left nostril was accidentally filled with collodion, as the pigs appeared similar to the ones with both nostrils closed. Eight died on an average of $9\frac{3}{4}$ days. Three lived thirty days, but in each instance the closed side partially opened. Number 92 lived only five days, but the resistance of this pig was probably lowered by a previous attempt to close the nostril.

The effect upon rabbits with one nostril closed is shown in Table 3. Seven had the right side closed and four the left. The longest duration of life is 113 days (No. 72); the shortest, 4 days (No. 57); the average duration was a little less than 45 days. Number 57 developed a catarrhal discharge from the left nostril, which undoubtedly interfered with the breathing through that side. As the right nostril was closed by operation, the rabbit had to breathe largely through the mouth. The distended abdomen was evidently due to swallowing the air. As there was a marked congestion of the upper lobe of the right lung, it is probable that an acute infection hastened

the death of the rabbit. Number 60 developed an abscess on the right side of the neck, which may have been the cause of death. It is noteworthy the uniform loss of weight of the rabbits with one nostril closed. Death resulted when about one-half of the weight was lost. Distention of the abdomen is usually not present in rabbits. A few rabbits that lived for months developed noisy breathing, suggestive of asthma.

It is clear that there is a causative relation between nasal obstruction and the death of these animals, as the number experimented upon is too large to attribute the deaths to accident. The determining cause of death is not clear. The length of time the animals live, and the symptoms do not point to asphyxiation, nor to carbonic acid gas poisoning as the cause. There are two factors that seem important in explaining the cause of death: First, infection as the result of lowered resistance; second, acute dilatation of the heart (Fig. 4). There are a certain number of guinea pigs and rabbits that show evidences of infection. The lungs are involved, and the lesions noted are intense congestion and areas of bronchopneumonia. The pulmonary condition is sufficient to account for death in some instances, but not in all. In my early examinations the condition of the heart was not closely studied, but with added experience I began to notice what was apparently a dilated condition of the heart. To determine this point it is necessary to have control animals of the same weight as the animals experimented upon, for the size of the heart is proportional to the weight of the animal. When the hearts of the pigs and rabbits experimented upon were compared with the animals of the same weight, it was found that dilatation regularly took place in the animals that lived 24 hours to two or three days. As the right ventricle was the portion involved, it would seem as though some mechanical impediment to the pulmonary circulation was the cause of the dilatation, and that the phenomenon was comparable to acute dilatation of the heart in poorly trained athletes, after excessive exertion.

The effect of nasal obstruction upon dogs, as outlined in this report, is based upon the study of 18 with partial closure of the nostrils, and upon 24 puppies born of mothers with nasal obstruction. A study of the breathing and pneumographic tracings of normal dogs has been made, and the condition of the lungs noted in a number of instances. Several years ago in another laboratory the nostrils of two dogs were closed, but the results were similar to the ones reported in the present series, so they will not be further considered.

Ether was used in all except No. 11. The orifice of the nostril was denuded and sutures were inserted. It is comparatively easy to close one nostril, but difficult to close the second. The effort of the dog to breathe tends to pull the sutures out, and the unavoidable infection of the parts leads to sloughing in some cases. Two-thirds, or more, of the opening of the nostrils were closed on an average. We will consider first, the changes noted in all of the dogs; and second, the special features that are of peculiar interest.

Labored breathing is a constant symptom, and is in a general way, proportional to the degree of obstruction, although an occasional dog seems to have but little dyspnea in spite of marked obstruction. The breathing is characteristic of asthma and emphysema; there is an apparent enlargement of the chest, and retraction of the intercostal spaces in the more marked cases. Pneumographic tracings of the breathing of dogs is shown in Fig. 5. The upper tracing, A, is from a normal dog; the middle, B, is from a dog (No. 11) with nasal obstruction. It shows the irregularity of the breathing as compared with the normal. The lowest tracing, C, is from a dog with cough, dyspnea and a peculiar, long, slow inspiration and a quick expiration. The dyspnea is increased on exercise. When both nostrils are closed the dogs have to breathe through the mouth, but if even one-fourth of the space remains they will draw air through the narrowed opening rather than breathe through the mouth.

The hair as a rule becomes shorter, thinner and lighter in color. This thinning of the hair usually commences over the abdomen and along the legs, then over the back and neck. A dandruff like scurf is noticed, but scabbing is not the rule unless the parts become excoriated. With this change in the hair there is a peculiar wrinkling of the skin in some instances. (Figs. 6, 7 and 8.)

The general nutrition, as measured by the body weight does not seem to be affected in the animals that live for a number of months, but a certain proportion of the dogs, more often the younger ones, as a result of lowered resistance, die from infection. They had abundance of wholesome food, and were under similar conditions. No attempt was made to weigh the food ingested, or to estimate the excretions.

As regards the resisting power, we can divide the dogs with nasal obstruction into two groups (Table 4): The older dogs that live for months and gradually develop dyspnea, sug-

gestive of asthma and emphysema; and the younger ones that are prone to infections. Those that die of infection usually have a mucopurulent discharge from the nostrils, emaciate, grow gradually weaker and die within three months. The determining cause of death seems to be bronchopneumonia. One of the younger dogs shown in the table (No. 104) lived 8 months and was killed because of a parasitic skin lesion. This apparent exception is explained by the fact that the nose was opened, and the increased space was followed by marked improvement in the breathing and the general condition. The number of young dogs experimented upon is too small to be positive as to just what influence age has upon the resisting power.

The effect of nasal obstruction upon the progeny is interesting. Twenty-four puppies have been born of mothers with about one-third of the normal breathing space (Table 5). Of these, two were found dead and three died within twenty-four hours. Eleven died at intervals from 31 to 93 days, under the best of care and with suitable food. One died of distemper on the ninety-ninth day. Three pups were used for other purposes, and from them no conclusions can be drawn. Two had their nostrils sewed up when they were five and one-half weeks old. The only conclusion that can be drawn from these two is that they both died sooner than is usual when pups of this age are experimented upon. (See Table 6.)

The two that are alive at present—48 days old—are not developing as normal dogs should. It is doubtful if they will grow to maturity.

The mothers seemed to have plenty of nourishment for the pups during the period of lactation, and later the puppies were given warm, fresh milk and other suitable food. I have no data as to the quality of the mother's milk. At birth the puppies appeared normal and developed fairly well for a few weeks, but they were less active than normal dogs, gained less in weight and gradually showed evidences of malnutrition. The hair as a rule became thinner, lost its natural gloss, and in one litter it was almost entirely gone. With this loss of hair there was a peculiar wrinkling of the skin similar to the mother. Macroscopic examination of the organs did not reveal the cause of death. A detailed study of one litter, in connection with the mother, will be given later. The point to be emphasized at this time is that interference with the normal nasal breathing of dogs has a marked deleterious effect

upon the progeny. In some instances the male parent had obstructed breathing. We have also a few observations where the male had obstructed breathing and the female was normal. So far our observations seem to show that it is through the female that the weakened vitality of the progeny occurs, but perhaps further observations over a longer period will show that the influence of the male is also a factor.

The effect upon the offspring of rabbits is based on a very limited experience. It is very difficult to breed rabbits with nasal obstruction, and several attempts have failed. One rabbit a month after the right nostril was closed had four bunnies. They were all very small and died within a few hours. About thirteen months later she had a litter of five. One found dead; one died on the twelfth day; one died on the sixteenth day; one on the twentieth day; and two alive on the twenty-seventh day (May 24).

We will next consider the resistance of normal pups as compared with those of the same age born of mothers with nasal obstruction (Table 6).

Four puppies, each five and one-half weeks old, were used; two were normal and two abnormal, that is, born of a mother with about one-third of the normal breathing space. The nostrils were closed in each instance. The table shows that one normal dog lived 38 days, the other 8 months with obstructed breathing, while the abnormal ones under similar conditions lived 18 and 15 days respectively. In one instance (105) both sides of the nose of the normal dog were not closed at the same time; but on the other hand one of the abnormal dogs (107) had more breathing space than the normal, yet lived less than one-half as long. One of the normal dogs (104) was peculiarly resistant for a young dog, but this is partially accounted for by the fact that the nose was opened for a few weeks prior to the death of the animal. This dog will be considered later.

The conditions under which these dogs were experimented upon were so nearly the same that, taken in connection with other experiments, the conclusion is warranted that there is a marked difference in the power of resistance between normal dogs and those born of mothers with obstructed breathing.

There are some interesting observations that have not been brought out in the study of the above tables. The history of two dogs will illustrate many of these points. Male puppy (104), five and a half weeks old is shown in Fig. 6, weight,

three and a half pounds; born of healthy parents, was used for the following experiment: Under ether both nostrils were closed on July 27, 1908. Dyspnea was noticed from the first, and it soon became apparent that the dog was not developing as he should. On September 13, the dog seemed sick. He had a temperature of 105° F., but on the 29th it had dropped to 101° F., and the dog seemed much better. In November it was noticed that he was losing his hair on the abdomen. This grew more marked until there was but little hair on the abdomen, legs and tail. Dyspnea increased, with shallow breathing and forced expiration, suggestive of asthma and emphysema. While the dog was gaining in weight it was not the gain that a normal puppy should make; the increased weakness and dyspnea became more and more evident, until death seemed imminent. On January 5th, I opened the nose so that the dog could breathe freely. There was an improvement in the condition; the hair commenced to grow and was more normal in gloss; the dyspnea almost disappeared and the dog appeared lively. Early in March he unfortunately became infected with the follicular mange, and it seemed best to kill the animal on March 30, 1909. Macroscopic examination of the lungs, liver, kidneys and spleen revealed nothing abnormal.

This dog illustrates what I have observed in other animals, that the reopening of the nose is immediately followed by improvement in the breathing and the general condition. It is to be regretted that he became infected with the mange, as further observation would have been desirable.

The history of the next dog is the most interesting of the whole series. Female (11), weight about 25 pounds. She was lively, healthy looking animal with long, reddish, curly hair of normal gloss. On October 31, 1907, I sewed up the right nostril. As healing took place, a small opening remained. On December 13 the left nostril was closed, and upon healing no opening remained. In spite of the labored breathing which followed, the air was drawn through the narrowed nasal opening and not through the mouth. The dyspnea gradually increased, the chest assumed a more barrel shaped contour, the hair was noticed first to become shorter and thinner, then bare places appeared over the rump, legs and abdomen (Fig. 7). The weight did not vary to any extent, but the dog was less lively than formerly. About five months after the nostrils were closed, the loss of hair had extended to the neck and

head, wrinkling of the skin was very evident and the dog was weaker and had an old and decrepit appearance (Fig. 8). The breathing was strongly suggestive of asthma and emphysema. The first week in June, 1908, she suddenly appeared better. Examination showed that the left nostril had torn open, and the increased breathing space accounted for the improvement noted. The hair commenced to come over each hip, and she appeared livelier in every way. The breathing space on each side was still narrowed. About this time it was noted that she was in heat for the first time since she was under observation. On August 31, 1908, she had eight puppies; one was found dead. All seemed normal in development. The seven that lived were apparently properly nourished by the mother, and were weaned at the usual time. About the time they were weaned it was noted that the hair of all the pups was growing thinner, and a peculiar wrinkling of the skin similar to the mother developed. Their growth was not normal, they commenced to emaciate, they were less lively and had a dried up, wizened appearance that reminded one of a child suffering from hereditary syphilis. Besides the loss of hair they had a dandruff-like scurf. The condition was suggestive of scurvy, but it could not have been due to the lack of suitable food, as they had plenty of fresh milk, meat, bread, etc. The last few days of their life they were separated into two groups, and special care was given to the feeding of one group. This made no difference in the length of time they lived.

I am indebted to my colleague, Dr. Buesser, for the following report as to the condition of the blood of the mother and puppies: "The hemoglobin estimate was made by the Tallqvist color scale. Two normal dogs for control showed 100 per cent each; mother, 60 per cent; four puppies, 50 per cent each; one, 45 per cent; and one, 60 per cent. The mother and the puppies show an anemia as compared with the two normal dogs used for controls. The leucocytes were somewhat increased in the mother, and markedly increased in the puppies; the red cells were smaller, showed signs of destruction by irregularities in shape, and contained less hemoglobin. The general picture indicates a secondary anemia."

The length of time the puppies lived is as follows: One, found dead; one, 57 days; one, 60 days; and five, 61 days. Post mortem examination of the puppies failed to reveal the cause of the peculiar condition which led to their death. The macroscopic changes in the organs were very slight. The

lungs were more or less congested, but inflated readily. Some congestion of the liver was noted in several.

On November 10, 1908, the mother of the pups was killed by chloroform, and an examination of the organs made. This dog had had obstructed breathing for a year. On the day she was killed the following observations were made. Respirations 22 per minute, very labored, with retraction of the intercostal spaces. Post mortem: Body warm. Skin over the abdomen and chest almost hairless, very smooth and soft, with no dandruff or scabbing. There were some short hairs over the back and legs; over the exposed parts the hair was very thin, with some irritation and scabbing. The skin of the face and neck was very wrinkled, that of the body to a less degree. The lungs collapsed when the chest was opened. No adhesions or fluid in the pleural cavities. Inflation of the lungs showed them to be comparatively normal. Kidneys slightly congested. No enlarged mesenteric glands.

It is claimed that unilateral nasal obstruction in man predisposes the lung of the same side to disease. Chauvet in a recent article concludes, from a study of unilateral closure of the nostrils of six rabbits, that the lungs of the side corresponding to the nasal obstruction is the more often diseased; that scoliosis and deformity of the chest occur; and that changes in the sinuses follow nasal obstruction. (*Revue Hebdomadaire de Lary. d'Otol. et de Rhin.*, March 20, 1909.)

From records of nearly one hundred animals experimented upon I found no evidence that disease of the lung bears any relation to the side obstructed, nor did I find the deformities of the chest pictured by Chauvet.

A mucopurulent accumulation occurs in the nostril obstructed, due probably to interference with drainage, but marked macroscopic changes in the turbinates, or sinuses, were not observed. It would be natural to expect changes to take place in the development of the bones in young animals with nasal obstruction, also that histologic changes would occur in the nose as the result of the long continued contact of the mucous membrane with the mucopurulent discharge, but on these points I have not sufficient data to warrant conclusions.

Many histologic changes have been noted in the lungs of the animals experimented upon, but the marked pathologic condition of some lungs and the comparative freedom from disease in others have made the interpretation of the findings somewhat difficult. The complete closure of the nostrils in

the smaller animals is followed by definite changes in the lungs. In the pigs that die within 24 hours there is usually an intense congestion, edema sometimes with hemorrhagic areas. If they live a little longer there is a peribronchial infiltration, or distinct evidences of a bronchopneumonia. If the animal lives several days we may find extensive hemorrhagic areas; dilatation of the vessels; interstitial infiltration of blood; atelectasis, with collapse of the bronchi; and emphysema. The bronchi may be normal, or show evidences of inflammation; empty, or filled with blood, mucus or desquamated epithelium. If the pig lives a number of weeks the inflammatory changes are less marked, but the emphysema is more extensive. While the lesions observed are varied, there is a certain harmony observed that is suggestive of one of two causes: First, inflammatory changes, the result of infection, due to the lowering of the vitality of the animal; and second, mechanical changes, the direct result of the interference with normal breathing, which leads to collapse of the bronchi, areas of atelectasis, and emphysema.

The study of the lungs of dogs with obstructed breathing may, in a general way, be divided into those where the inflammatory lesions are prominent; and those where the mechanical, or emphysematous changes, are predominant. The lowering of the resistance, noticeable in the younger dogs, predisposes to infections; so we naturally find bronchopneumonia, seropurulent pleurisy and other inflammatory lesions as evident causes of the comparatively prompt death of the animal. On the other hand, if the dog has sufficient vitality to withstand infection, the mechanical obstruction to breathing leads to gradual changes, of which emphysema is the type.

A number of sections from the lungs of the dog (No. 11) whose history was detailed above have been studied. We must remember that as a result of a year of difficult breathing the dog had developed all of the symptoms of a chronic asthma with emphysema besides certain peculiar nutritional changes, referable to the hair and skin. We might expect under such circumstances that there would be marked changes in the structure of the lungs, but macroscopically they seemed normal and even the microscopic changes though significant, hardly seemed commensurable with the clinical symptoms. We found evidences of a chronic bronchitis, increase of interstitial tissue, bronchopneumonia, and distinct areas of emphysema.

The dilatation of the right ventricle and the weakening of the heart has an important bearing on the changes in the lungs. The cardiac failure would naturally lead to intense congestion and dilatation of the vessels as an early symptom, and brown induration and increase of interstitial tissue later.

We cannot transfer the results of experiments upon animals to man without certain reservations, but our clinical experience, in a general way, is in harmony with the results as outlined above. Patients with nasal obstruction usually have a lowered general resistance, are more susceptible to colds and other infections, and there seems to be a causal relation between that syndrome of symptoms commonly known as "Catarrh," and imperfect nasal breathing.

Obstructed nasal breathing has long been recognized as a factor in the etiology of asthma. As long as the underlying cause of asthma is not known, and the pathology indefinite, it would seem that experiments upon animals offered a fruitful field for the study of this disease.

The following conclusions are suggested by the results of the experiments outlined above:

1. That nasal obstruction leads to death, or serious impairment of vitality.
2. That the lowered resistance predisposes to infections.
3. That local disease of the respiratory tract is induced.
4. That obstruction of the nostrils leads to dilatation of the heart.
5. That changes in the skin and the blood of the dogs occur.
6. That symptoms resembling asthma and emphysema may be induced in the lower animals.
7. That emphysema of the lungs can be demonstrated histologically.
8. That reopening the occluded nostrils is followed by prompt disappearance of the symptoms.

TABLE No. 1. GUINEA PIGS.

Both Nostrils Closed.

Table showing the effect upon thirty pigs. The nostrils of the first two pigs were sutured. All of the others were closed by cotton and collodion.

Lab. No.	Weight in gms.	Duration of life.	Remarks.
2	.....	6 Days.	Abdomen swollen the first 24 hours, later a little air through nose.
3	.....	12 Days.	Breathed partially through the nose.
7	.....	18 Hours.	Nose entirely closed. Abdomen distended.
8	.....	31 Days.	Abdomen distended at first, later breathed through the nose.
15	.....	36 Hours.	Nose entirely closed. Abdomen distended.
17	.....	36 Hours.	Nose entirely closed. Abdomen distended.
18	.....	15 Hours.	Nose entirely closed. Abdomen distended.
19	310	4 Days.	Nose probably not entirely closed. Abdomen not distended.
20	310	4 Hours.	Nose entirely closed. Abdomen distended within an hour.
22	300	2 Days.	Nose probably not entirely closed. Distention not marked.
23	300	3 Days.	Nose not entirely closed. Not fed after closure for 48 hours. No distention.
24	300	3 Days.	Nose not entirely closed. No distention.
25	302	2 Hours.	Distention marked. Stomach ruptured and contents in abdomen.
27	300	2 Hours.	Distention not marked.
28	302	30 Hours.	Abdomen moderately distended.
30	290	12 Hours.	Not fed morning of operation. Abdomen distended. Lower bowel filled.
31	300	12 Hours.	Not fed morning of operation, nor afterwards. Distention moderate. Lower bowel filled.
32	300	12 Hours.	Not fed morning of operation, nor afterwards. Distention marked. Lower bowel filled.
33	290	12 Hours.	Not fed morning of operation, nor afterwards. Not distended. Lower bowel filled.
34	305	52 Hours.	Not fed morning of operation, nor for 24 hours afterwards. Not distended. Not much food in lower bowel.
75	950	24 Hours.	Not distended. At end of 23 hours lively. Put an extra dressing of cotton and collodion. Died within 45 minutes.
77	853	36 Hours.	Distended.
78	800	60 Hours.	Distended.
79	753	36 Hours.	Not distended.
119	550	18 Hours.	Moderately distended.
120	520	18 Hours.	Moderately distended.
121	440	18 Hours.	Moderately distended.
136	300	16 Hours.	Marked distention.
137	260	56 Hours.	Very little distention. Breathed a little through nose.
138	255	36 Hours.	Distention marked.

TABLE No. 2. GUINEA PIGS.

One Nostril Closed.

No. 36 closed by Cotton and Collodion. All others closed by suture while animals were under Ether.

Lab. No.	Weight Nostril in gms. closed.	Nostril	Duration of life.	Remarks.
1	.....	Left.	8 Mo.	Wt. March 27-'08, 320 gms. At death 265 gms. No distention.
9	.....	Left.	8 Mo.	Wt. March 27-'08, 300 gms. At death 305 gms.
36	270	Left.	10 Days.	No distention. Wt. Dec. 23-'08, 250 gms.
42	255	Right.	6 Days.	No distention.
44	360	Right.	14 Days.	No distention.
45	290	Right.	10 Days.	No distention.
46	310	Right.	10 Days.	No distention.
47	305	Right.	15 Days.	No distention.
48	300	Right.	30 Days.	No distention. Right nostril opened up about $\frac{3}{4}$.
49	310	Right.	30 Days.	No distention. Right nostril opened up about $\frac{1}{2}$.
50	300	Right.	30 Days.	No distention. Small opening.
63	375	Right.	8 Days.	No distention.
66	290	Right.	12 Hours.	Marked distention. Probably pig did not breathe through either nostril. (See No. 67.)
67	270	Right.	12 Hours.	Very little distention. Probably pig did not breathe through either nostril. (See No. 66.)
92	365	Right.	5 Days.	Distention. This pig had nose closed before, but opened up. Resistance probably lowered.

TABLE NO. 3. RABBITS.

One Nostril Closed.

The nostrils were closed by sutures and Collodion dressing while the rabbits were under Ether. The first weight was taken at the beginning of the experiment, the second after the death of the animals.

Lab. No.	Weight Nostril in gms. closed.	Duration of life.	Remarks.
57	Right.	4 Days.	Some distention. Catarrhal discharge from left nostril, which interfered with breathing. Right side entirely closed.
60	Right.	62 Days.	Emaciated. Swelling the size of small orange right side of neck (abscess).
68	Right.	45 Days.	Right nostril entirely closed.
69	Right.	49 Days.	Right nostril entirely closed.
71	Right.	47 Days.	
72	Right.	113 Days.	Right nostril entirely closed.
95	Left.	44 Days.	
96	Left.	30 Days.	
97	Left.	19 Days.	Left nostril entirely closed. Emaciated, wt. 11 days after closure of nose, 1340 gms.
98	Left.	23 Days.	Left nostril opening size of pin head.
130	Right.	57 Days.	Right nostril opening size of pin head.

TABLE No. 4.
Difference in Resisting Power Between the Old and the Young Dogs with Nasal Obstruction.
Older Dogs.

Lab. Average Degree of No. weight. obstruction.	Duration of life.	Remarks.
11 30 lbs. Two-thirds.	1 year.	This dog had asthma and emphysema, with loss of hair and wrinkling of skin. Killed.
81 24 lbs. Three-fourths.	8 months.	Accidental death, otherwise probably would have lived for months.
65 20 lbs. Two-thirds.	10 months.	Accidental death, otherwise probably would have lived for months. This dog somewhat younger than most of this group.
61 21 lbs. Two-thirds.	alive.	This dog has lived since Feb., 1908, with nasal obstruction. At present well nourished.
64 26 lbs. Three-fourths.	14 months.	Accidental death, otherwise probably would have lived for months.
82 22 lbs. Four-fifths.	alive.	This dog has lived since March, 1908, with nasal obstruction. Evidence of Asthma and Emphysema, but well nourished. Hair thin.
99 25 lbs. One-half.	alive.	This dog lived since June, 1908, with nasal obstruction. Some Dyspnea, but well nourished.
Younger Dogs.		
12 12 lbs. One-third.	Not quite 3 months.	Died from acute infection of the lungs. Congestion, and Consolidation of portion Lungs.
73 16 lbs. Less than 1.	19 days.	Mucopurulent discharge from obstructed (right) nostril. Intense congestion of lungs and consolidated areas.
105 7 lbs. Four-fifths.	43 days.	5½ weeks old when experiment commenced. Obstruction very marked. Seropurulent fluid in pleural cavities. Lung congested and consolidated.
104 9 lbs. Four-fifths.	8 months.	This dog became infected with follicular mange, and was killed. Asthma and emphysema had developed to a marked extent. 5½ weeks old when experiment was commenced. Exceptionally resistant for young dog.

(Remarks: Note how much more susceptible the younger dogs are to infections, and how they die after a few months, while the older dogs live for many months. The lungs are regularly involved in the younger dogs, while the older ones develop asthma and emphysema, without evidence of infection.)

TABLE No. 5.

The effect upon the Progeny when the Mothers have about Two-thirds of Their Nasal Breathing Obstructed.

Mothers.		Puppies.		Remarks.
Lab. No.	Wt. lbs.	No. in litter.	Wt. oz.	
11	33	1	Found dead.	At birth they appeared normal. Before death they were emaciated, scurvy-like, with hair mostly gone and skin wrinkled. They had plenty of fresh, wholesome food. They resembled the mother at the time of death.
		2	7.66	
		3	10.66	
		4	8.25	
		5	9.33	
		6	9	All very small. One was found dead, the other three died in about 24 hours. Emaciation, hair thin. Wt. at death, 4.75 lbs. Sewed up the nostrils of two, when 5½ weeks old. Three used for other purposes. Little thinning of hair, progressive weakness and emaciation. No cause of death ascertainable in the first three. The fourth died of distemper.
		7	6.12	
		8	8.66	
65	20	4	.....
65	25	1	9.20	
61	22	5	Neither of the puppies are developing as normal ones should. Age, 41 days. No. 1 losing wt. No. 2 slight gain.
61	25	4	1 8	
		2	7	
		3	8	
		3	31	
82	24	2	1 4.50	Summary: Of the 24 pups, two were found dead; fourteen died under the best of care; one died from distemper; three were used for other purposes and from them no conclusion can be drawn. The longest any lived was 99 days. Most of them died within two months, or less. Two had both nostrils closed when 5½ weeks old. The only conclusion that can be drawn from these two is that they both died sooner than is usual when pups of this age are experimented upon. The two that are alive after 41 days show diminished resistance.
		2	5.50	

Summary: Of the 24 pups, two were found dead; fourteen died under the best of care; one died from distemper; three were used for other purposes and from them no conclusion can be drawn. The longest any lived was 99 days. Most of them died within two months, or less. Two had both nostrils closed when 5½ weeks old. The only conclusion that can be drawn from these two is that they both died sooner than is usual when pups of this age are experimented upon. The two that are alive after 41 days show diminished resistance.

TABLE No. 6.

Resistance of Normal Pups as Compared with those of the same age Born of Mothers with Nasal Obstruction.

Abnormal.		Normal.	
106.	Wt. 2 lbs. 7 oz. Age, 5½ weeks. Sewed up both nostrils. Lived, 18 days. Wt. at death, 18 1/3 oz.	105.	Wt. 5¼ lbs. Age, 5½ weeks. Sewed up left nostril, and 11 days later sewed up the right nostril. Lived, 38 days. Left nostril pin head opening, right entirely closed.
107.	Wt. 2 lbs. 6 oz. Age, 5½ weeks. Sewed up both nostrils. Lived, 15 days. Wt. at death, 19½ oz. Pin head opening right nostril. Left has a little larger opening.	104.	Wt. 3¼ lbs. Age, 5½ weeks. Sewed up both nostrils. Left nostril entirely closed, right about three-fourths closed. Asthma and emphysema developed. Became infected with follicular mange and was killed after living eight months.

(Remarks: Note that the ages of the four dogs were the same; that the normal dogs lived 38 days and eight months respectively, while the abnormal ones lived 18 and 15 days respectively. In one instance (105) both sides of the nose of the normal dog were not closed at the same time; but on the other hand, No. 107 (abnormal) had more breathing space than the normal (105), yet lived less than half as long. No. 104 (normal) was peculiarly resistant for a young dog.)

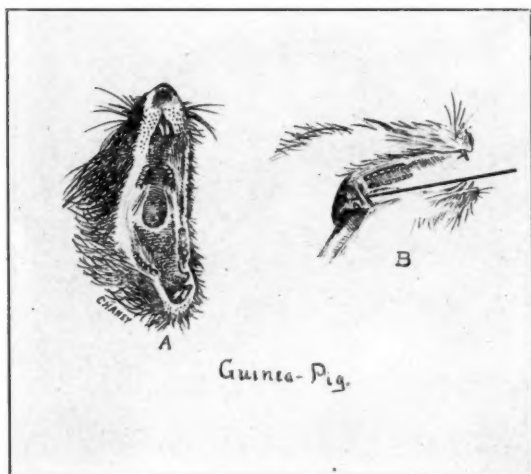


FIGURE 1.

A. Anterior view of guinea pig's throat, showing fauces, soft palate with sphincter-like opening. B. Lateral view, showing probes through opening in soft palate.

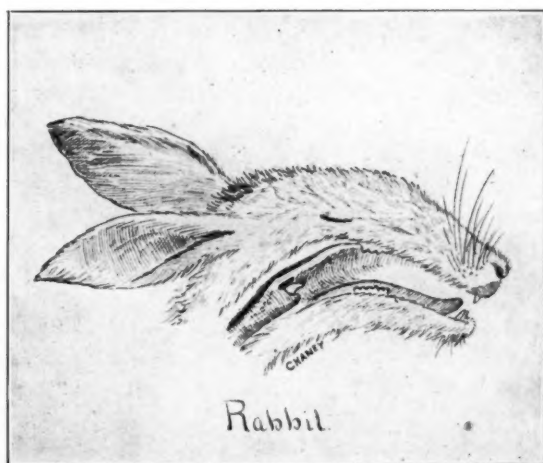
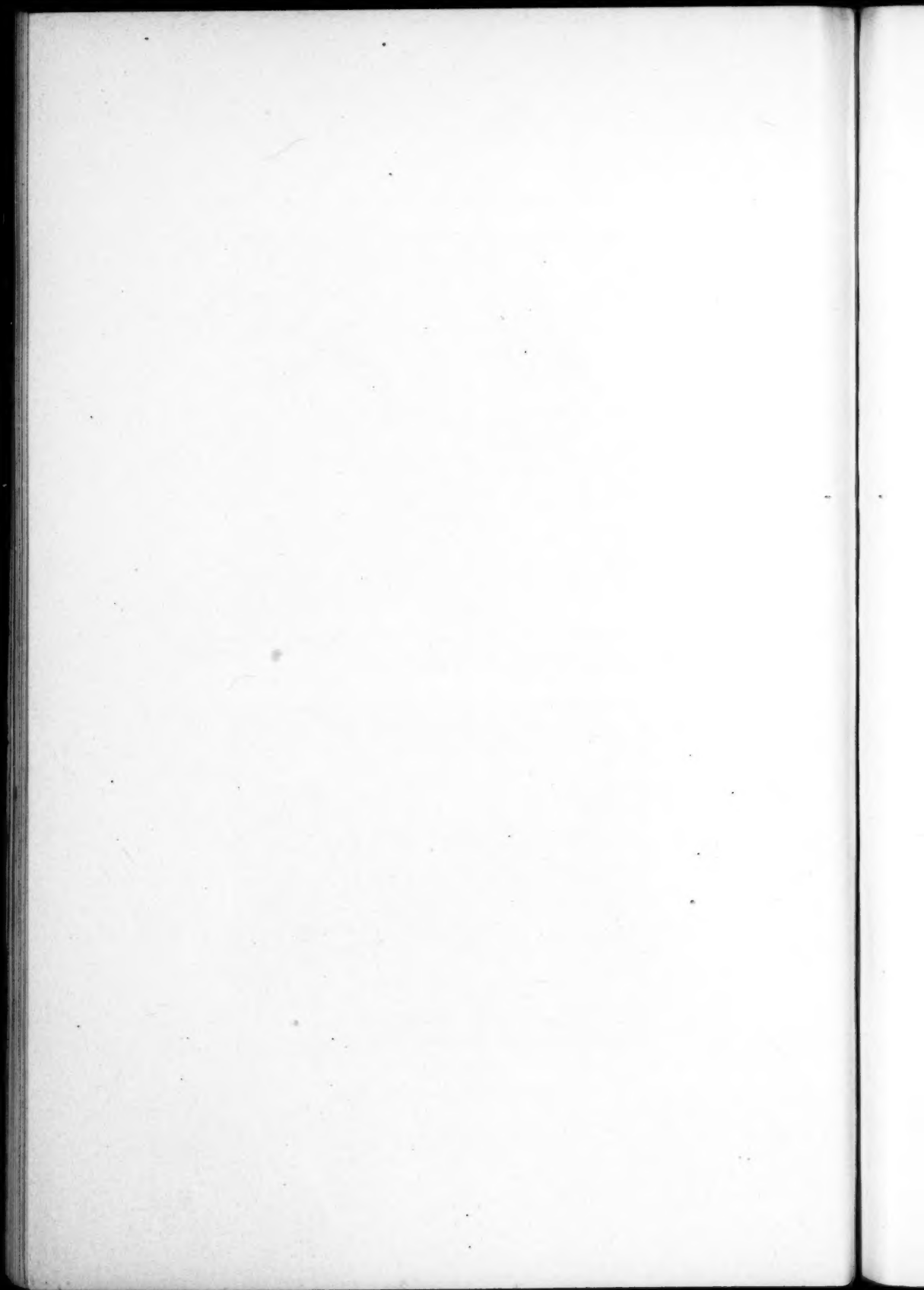


FIGURE 2.

Lateral view of rabbit's throat.



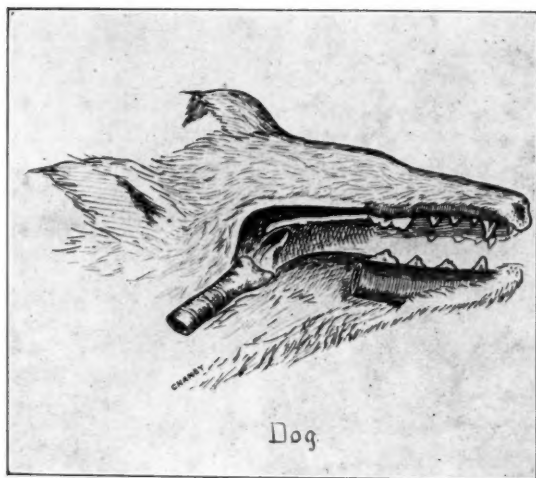


FIGURE 3.
Lateral view of dog's throat.

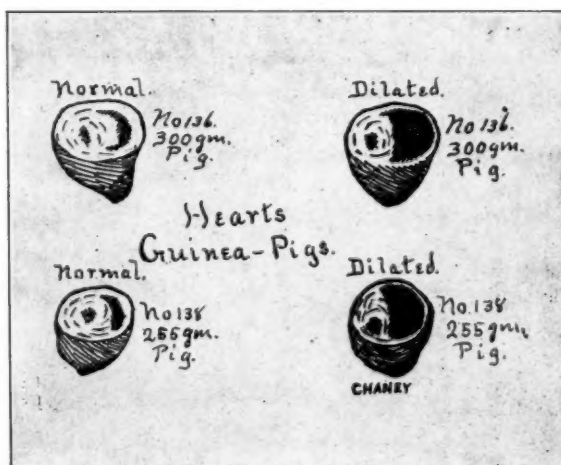
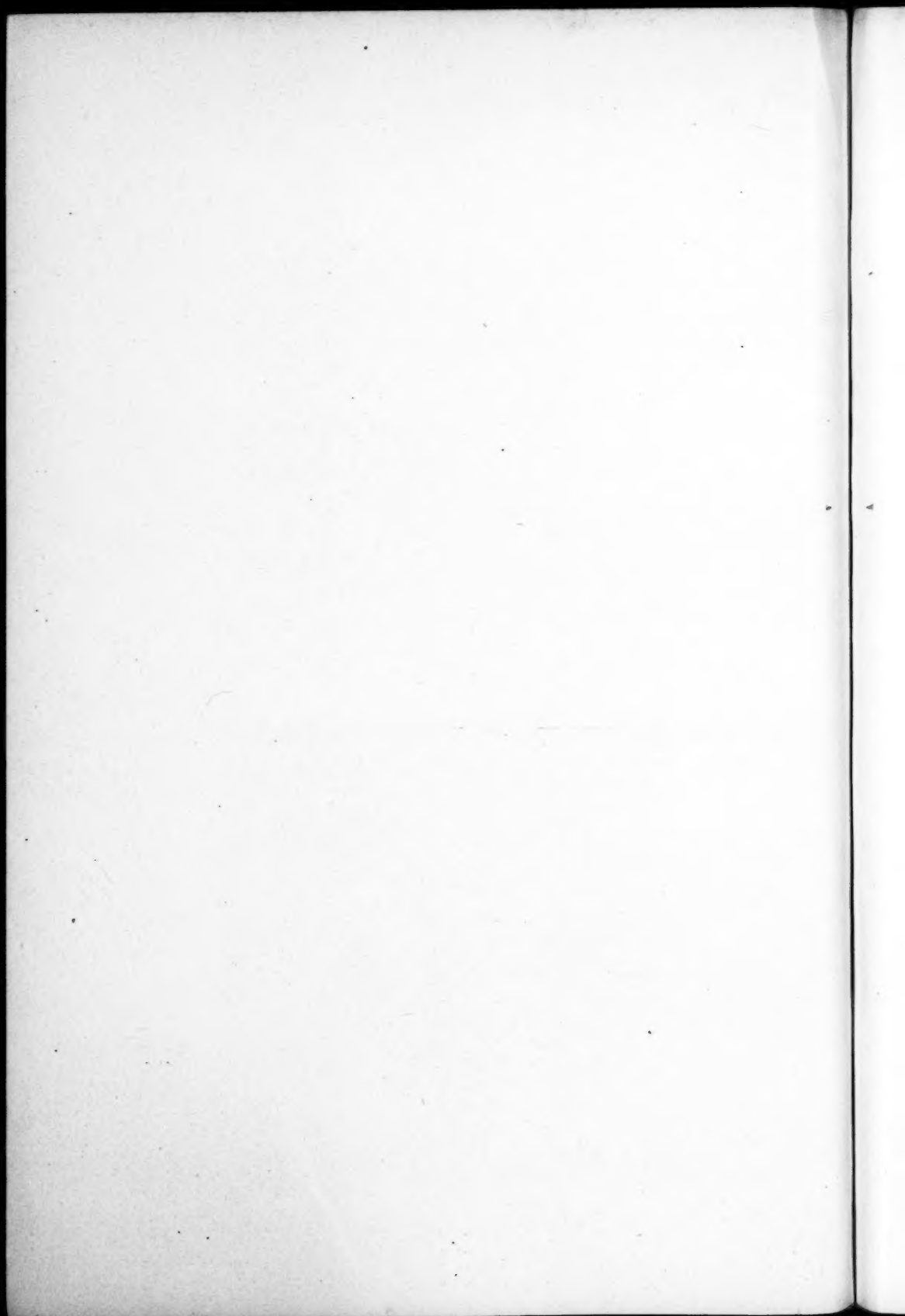


FIGURE 4.



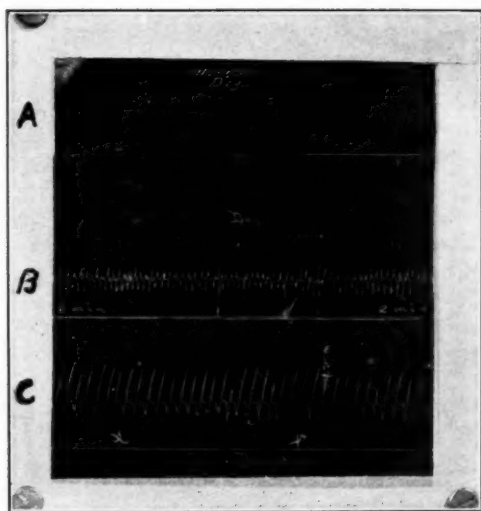


FIGURE 5.

Pneumatograms. A. Normal dog. B. Dog with nasal obstruction. C. Dog with dyspnea.



FIGURE 6.

Dog No. 104. Showing loss of hair with nasal obstruction.

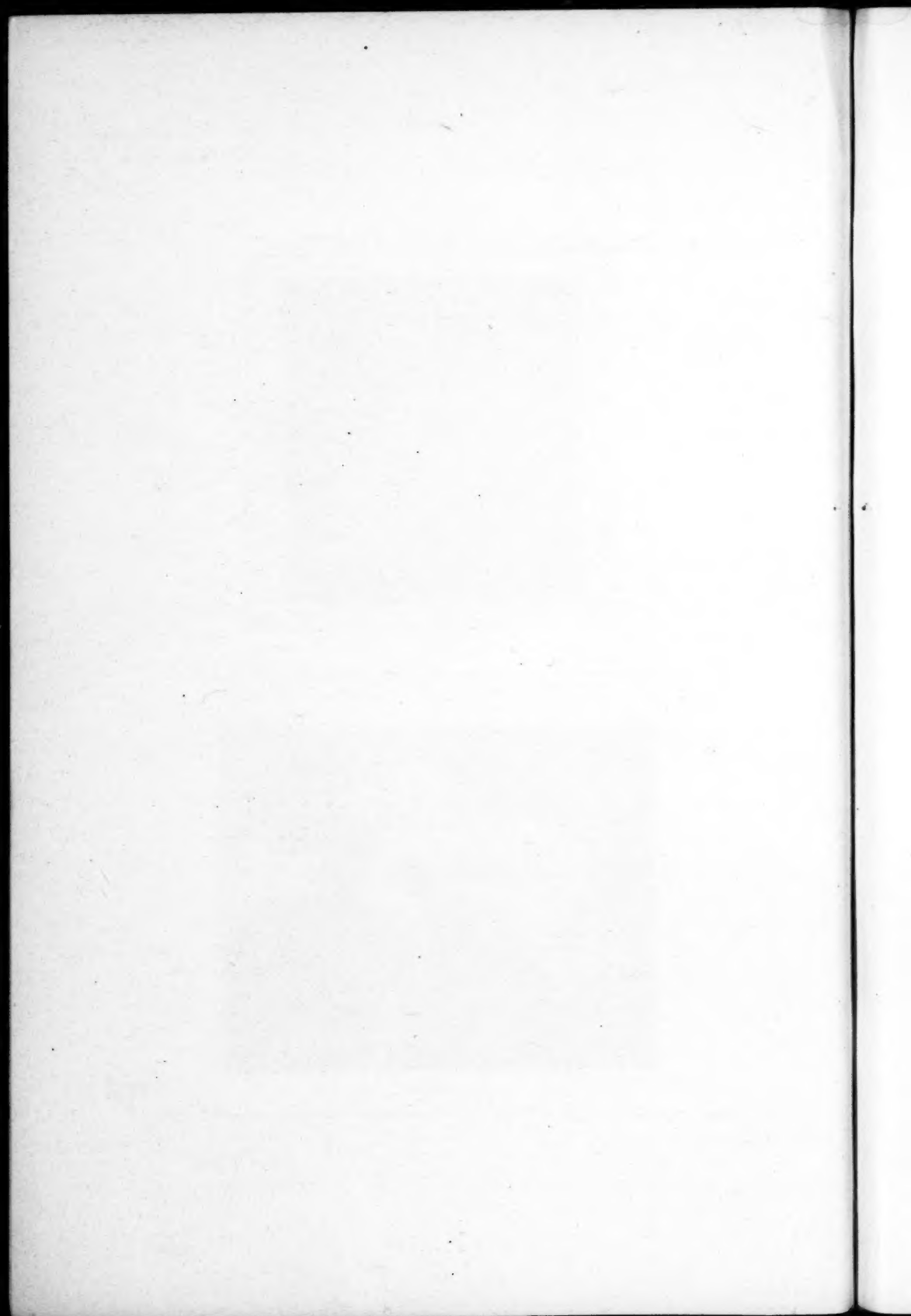




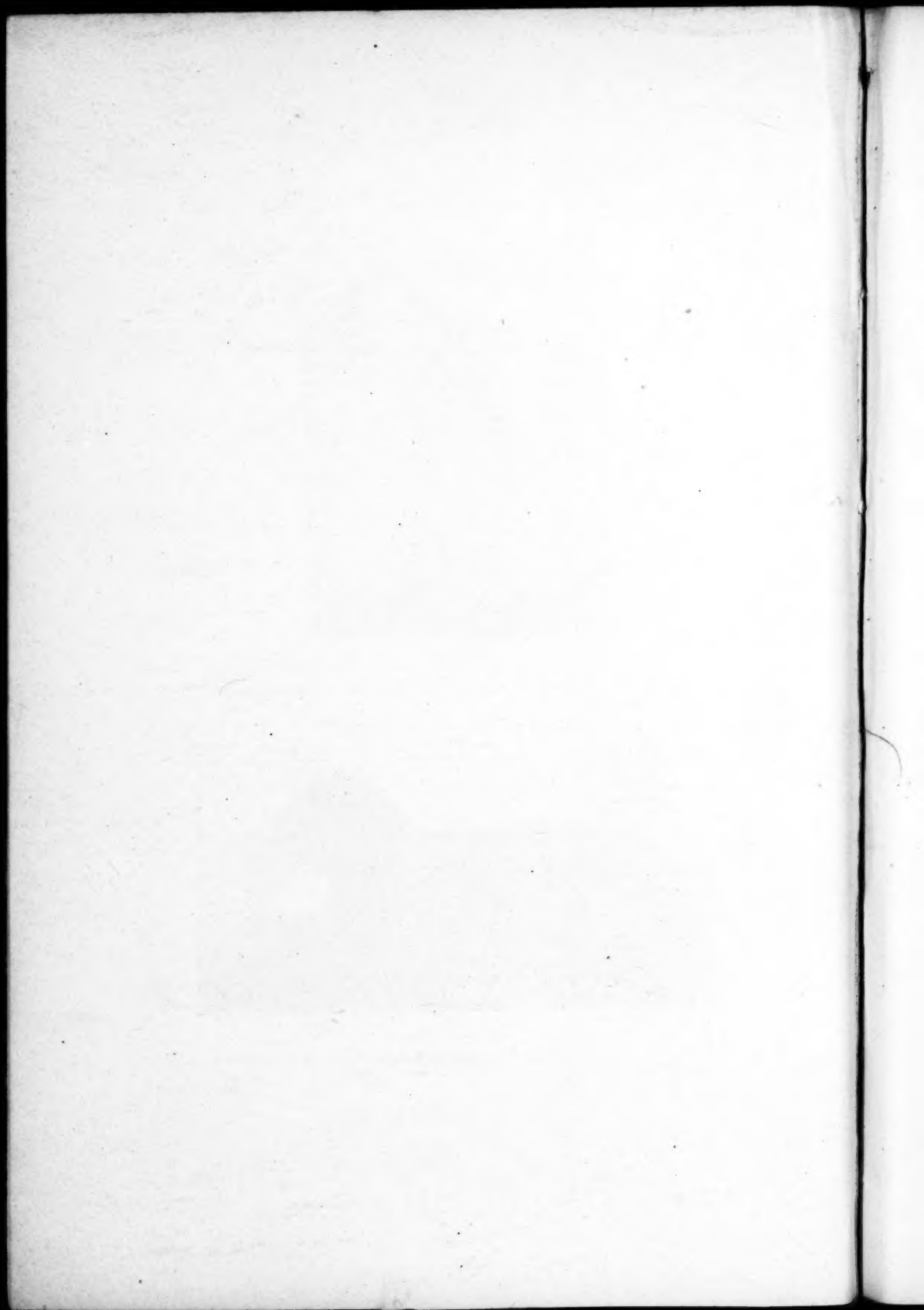
FIGURE 7.

Dog No. 11. Showing loss of hair and wrinkling of skin following nasal obstruction.



FIGURE 8.

Dog No. 11. Showing loss of hair and wrinkling of skin following nasal obstruction.



XXXIV.

THE PHENOMENA OF VESTIBULAR IRRITATION
IN ACUTE LABYRINTHINE DISEASE, WITH
SPECIAL REFERENCE TO THE STUDIES OF
DR. BARANY OF VIENNA.

BY PHILIP D. KERRISON, M. D.,

NEW YORK.

However interesting the earlier experiments and hypotheses may have been as bearing upon the physiology and function of the semicircular canals, we must now recognize the studies of Flourens in 1824 to 1828, and the later experiments of Prof. Ewald of Strasburg, as the basis upon which our present clearer understanding of the phenomena of vestibular irritation mainly rests.

Ewald's Experiments (Fig. 1).—Ewald¹ experimented separately upon the three semicircular canals of pigeons after the following method: Having exposed the selected canal, a small hole is drilled into its most prominent presenting part. A second opening between the first and the small or smooth end of the canal is bored, and into this a lead mass is introduced, completely obliterating its lumen at this point. Into the first opening is introduced and secured a small cylinder, open at both ends, within which a minute, movable piston rests. To the outer end of the cylinder is attached a piece of rubber tubing, the opposite end of which communicates with a rubber ball or bulb. Obviously compression of the bulb will drive the piston further into the cylinder and cause displacement of the endolymph in the canal experimented upon; and since this canal is closed in the direction of its small end, it is evident that the endolymph movement must be toward its ampulla. It is equally clear that if we begin with a partially compressed

1. Ewald. Physiologische Untersuchungen über das Endorgan des nervus octavus. 255-266.

bulb, we may by release of pressure induce an endolymph movement in the opposite direction, i. e., away from the ampulla and toward the small end of the canal.

These experiments gave in the different canals the following reactions:

Right External, or Horizontal Canal.—Compression of bulb (causing endolymph displacement toward ampulla) was followed by strong, gradual movement of the head, exactly in the plane of the canal, to the left. Coincidentally with this head movement, the eyes were moved, also in the plane of the canal, to the left. On release of pressure the head and eyes quickly regained their normal position.

Suction (i. e., endolymph movement in right horizontal canal toward small end of canal) gave rise to gradual movement of head and eyes, always in the plane of the canal, to the right. But this latter movement to the right caused by suction was much less forcible than the opposite movement caused by compression.

Right Posterior Vertical Canal.—Compression (i. e., endolymph movement toward ampulla) was followed by gradual movement of the head, exactly in the plane of this canal and toward its ampulla, i. e., to the right. Suction gave rise to movements of the head and eyes in the same plane but in the opposite direction, i. e., to the left. But in this canal, suction was followed by much stronger movements than those produced by compression.

The reactions of the anterior vertical canal are similar to those of the posterior vertical, varying only in accordance with its different plane.

It is worthy of note that in the case of the horizontal canal the strongest head and eye movements followed displacement of endolymph in the direction of the ampulla, whereas in the posterior vertical and anterior vertical canals the strongest movements were those which followed displacement of endolymph toward the small ends of the canals. In each canal, however, the strongest movement produced was toward the opposite side.

Vestibular nystagmus is always composed of a quick movement in one direction and a slow movement in the opposite direction. It must be borne in mind that in the experiments above described the gradual movement of head and eyes, caused by either compression or suction, corresponds to the

slow component of vestibular nystagmus, and represents therefore a nystagmus in the opposite direction.

Ewald's experiments established definitely the following important facts: (a) Excitation of a single canal can produce nystagmus only in a plane corresponding to the plane of the canal; (b) by reverse movements of the endolymph in any single canal we can produce a reversal of the direction of the induced nystagmus, and (c) the strongest nystagmus which can be induced by irritation of a single canal is always in the direction of the ear experimented upon.

For any one who has the position and plane, and the relative positions of the ampullar and small ends, of each canal clearly fixed in memory, the writer suggests the following simple rule, based upon Ewald's experiments, by which the reactions following endolymph movements in the different canals may be easily recalled, viz.:

Displacement of endolymph in any particular canal gives rise to nystagmus in which the eyes move in a plane parallel with the plane of the canal, and of which the slow movement is always in the direction in which the endolymph moves.

Remembering that the direction of vestibular nystagmus takes its name from the direction of the quick eye movement, and that the gradual head and eye movements of Ewald's experiments correspond to the slow component of vestibular nystagmus, the wording of the above rule may be reversed and abbreviated as follows:

Nystagmus induced by endolymph displacement in any particular canal is in a plane parallel with the plane of that canal, and in the direction opposite to that of the endolymph displacement.

Character of Vestibular Nystagmus.—To establish a claim to vestibular origin a nystagmus must present the following characteristics: (1) It must be composed of a quick movement in one direction and a slow movement in the opposite direction. (2) It is increased usually in rapidity and always in length of excursion when the eyes are turned voluntarily in the direction of the quick movement. (3) It becomes weak, or may disappear wholly, when the eyes are turned in the direction of the slow nystagmic movement.

The above are invariable characteristics of nystagmus of vestibular origin, whether produced by experimental irritation or in the course of acute labyrinthine disease.

Vestibular nystagmus may be horizontal, oblique, vertical or

rotary. The nystagmus caused by acute labyrinthine disease is practically always rotary.

The Caloric Reactions.—The so-called caloric tests, the technic and significance of which were first established by Dr. Barany of Vienna, depend upon the following easily demonstrable facts:

(a) If we irrigate either ear of a normal person with water at body temperature, no objective or subjective phenomena result.

(b) If we repeat this experiment with water appreciably below blood temperature we shall observe the following evidences of vestibular irritation, viz.: (1) rotary nystagmus toward the ear not irrigated; (2) the patient experiences vertigo, and (3) exhibits marked disturbances of equilibrium.

(c) If we substitute in this experiment hot water, or water considerably above blood temperature, we shall induce exactly the same phenomena with these differences, viz.: (1) The quick nystagmic movement will be toward the ear irrigated, and (2) the ataxia will exhibit certain differences in accordance with laws to be referred to later.

*Barany's Theory As to the Causation of the Caloric Reactions.*²—We must regard the whole labyrinthine cavity as a vessel containing fluid of temperature probably identical with that of the blood. If now we bring cold or hot water in contact with one wall of this vessel, the specific gravity of that part of the contained fluid nearest this wall will be increased or reduced, and will sink or rise according to the physical laws governing fluids of different specific gravity.

The parts of the semicircular canal system nearest the surface of the inner tympanic wall are (1) the anterior part of the horizontal canal, and (2) the external, or ampullar, third of the anterior vertical canal which points almost directly downward (Fig. II). Syringing the ear with cold water would therefore influence the temperature first at these points. With the head in the upright position, however, endolymph movement in the external canal would be prevented by its horizontal position. On the other hand, sudden cooling of the ampullar end of the anterior vertical canal would by condensation of the endolymph at this point give rise to an endolymph movement downward toward its ampulla. That this experiment in normal persons is invari-

2. Barany. *Physiologie und Pathologie des Bogengang-Apparates beim Menschen*. 27-29.

ably followed by rotary nystagmus toward the opposite side is in exact accord with Ewald's experiments. This theory of the causation of caloric nystagmus is further supported by the fact that if the head is quickly inverted so that the top of the head is directed downward toward the floor, the direction of the nystagmus is reversed, i. e., is now toward the ear irrigated. That the use of hot water, which by reducing specific gravity would cause an endolymph movement in the opposite direction, invariably gives rise to rotary nystagmus toward the ear irrigated, lends further support to this view as to the causation of these phenomena.

The value of these experiments depends upon the fact that after the vestibular apparatus has been destroyed, either surgically or by disease, no reaction follows the application of heat or cold. The caloric tests are therefore invaluable as a means of determining impairment or loss of vestibular function.

Rotation or Turning Experiment.—When a normal individual, seated with head erect upon a revolving chair, is turned fairly rapidly in either direction,—let us say to the left,—a horizontal nystagmus is set up with the quick eye movement in the direction in which he is turned, i. e., to the left. When the rotations are suddenly arrested, the nystagmus is reversed, the quick eye movement being now to the right.

Barany's experiments with a large number of supposedly normal persons showed that 10 fairly rapid rotations produce a maximum reaction, and that the average duration of the nystagmus following this experiment is 40 to 45 seconds. This describes the average, with great variations in individuals.

Explanation of Rotational Nystagmus In Accordance With Ewald's Experiments.—The mechanical influence of sudden turning of the head in the horizontal plane upon the fluid in any particular canal depends upon the relation which the plane of this canal bears to the horizontal plane. Thus, with the head erect the two horizontal canals are approximately in the horizontal plane. When the head is suddenly turned in either direction—let us say to the right—the fluid in these canals by reason of its inertia at first lags behind, i. e., suffers an initial displacement in the opposite direction. This initial endolymph movement in the right horizontal canal is toward its ampulla, while in the left horizontal it is toward the small end of the canal. Now according to Ewald's experiments, these are precisely the endolymph movements which in these canals, give

rise to nystagmus to the right, and this phenomenon is always present during 10 rotations to the right. When, however, the rotations are suddenly stopped there occurs, again by reason of its inertia, an endolymph displacement in the opposite direction with the result that the direction of the nystagmus is reversed, i. e., rotation to right is followed by nystagmus to left.

During rotation about a vertical axis it is evident that the endolymph movement in any canal is at its maximum when the canal lies in the horizontal plane, and becomes progressively less as the plane of this canal is changed and the angle of extension between its plane and the horizontal plane is increased. Finally when the plane of the canal becomes vertical, i. e., is at right angles to the plane of rotation, no appreciable endolymph movement results from rotation in the horizontal plane. Obviously, therefore, during rotation with the head erect, the influence of the two vertical canals is practically eliminated. When, however, the head is bent directly forward or directly backward to an angle of 90° with the vertical, the posterior vertical canals are brought more into the horizontal plane and rotation gives rise to a rotary nystagmus due chiefly to endolymph movement in these canals.

*Rule for Determining the Form of Nystagmus Which Shall Follow Rotation*³.—Sitting erect upon a revolving chair a person revolves about a vertical axis. If now we imagine his eye cut through in a horizontal plane, i. e., by a plane at right angles to the axis about which he revolves, it is evident that this section will describe a line upon the cornea which will vary according to the position of the head. This line will indicate the form of the nystagmus (Fig. 3).

Thus, with head erect, the horizontal plane in bisecting the eye will form a line passing horizontally across the cornea, and produce a horizontal nystagmus (Fig. 3, A). With head bent laterally toward the shoulder so as to form an angle of 45° with the vertical, a horizontal section will be indicated by a line passing obliquely across the cornea, and produce an oblique nystagmus (Fig. 3, B). If the head is bent fully toward the shoulder so as to form an angle of 90° with the vertical, the eye will be bisected in a plane at right angles to its transverse diameter, and give rise to a vertical nystagmus (c). With the head bent forward so that the face looks directly downward, the horizontal plane would divide the orbit so as to re-

3. Barany. *Ibid.* 12-13.

move a segment which would include the iris. It should, therefore, be indicated by a circular line about this iris. The character of the nystagmus, however, is indicated by the points of contact at which the horizontal plane enters the orbit, and not by those at which it cuts its way out. With the head bent directly forward, therefore, a horizontal section is indicated by a curved line above the iris, and turning to the right will be followed by rotary nystagmus to the left (d). With head bent directly backward so that the eye looks upward, a horizontal section describes a curved line below the iris. With head in this position, rotation to the right is followed by rotary nystagmus to the left. But in this case the concavity of the nystagmic curves is directed upward (e).

This rotation experiment is therefore particularly instructive since it enables us to induce at will different forms of nystagmus, and to study the accompanying variations of vertigo and ataxia.

Vestibular Symptoms In Acute Suppurative Labyrinthitis.—

We must now revert for a moment to the clinical side of labyrinthine disease. In this we shall have to confine ourselves to a very brief synopsis of the symptoms referable to vestibular irritation.

Let us assume that the patient is suffering from a chronic suppurative otitis media of the right ear, from which the infection has spread to the inner ear. Shortly or immediately after invasion of the labyrinth, he experiences distressing vertigo, which usually forces him to go to bed. Examination of the eyes reveals marked rotary nystagmus toward the left (sound) side. The nystagmus is at this time present in whatever position the eyes may be turned, but is aggravated when they are turned toward the left (i. e., in the direction of the quick nystagmic movement), and is minimized when they are voluntarily held in the opposite direction. The vertigo is of rotary character, surrounding objects seeming to rotate about him in bewildering fashion. If supported in the upright position, objects seem to rotate in a vertical plane usually from the right (diseased) side toward the left. Occasionally they seem to rotate in the opposite direction. When lying upon his back, the plane of seeming rotation is changed from the vertical to the horizontal. With eyes closed, he has the impression of himself rotating. If able to stand, he is markedly unsteady, and with eyes closed falls, or tends to fall, toward the right (i. e., diseased) side. At the onset, nausea

and vomiting are very frequent, if not invariable, symptoms. All these symptoms are of lessened severity while he lies quietly in bed. He usually maintains voluntarily, therefore, a quiet position in bed.

Course of the Disease.—All of the above symptoms usually subside fairly rapidly and in a somewhat regular order. That is to say, the vertigo and ataxia regularly disappear before the nystagmus. By the end of the first week, the vertigo may have ceased to distress the patient as he lies quietly in bed; while the nystagmus may be still very marked. Sudden or violent head movements may, however, induce recurrence. From the end of the second to the end of the fourth week, not only the vertigo and ataxia, but also the spontaneous nystagmus, may have completely disappeared. The patient is now free from subjective symptoms referable to vestibular disturbance, and may be able to walk or move in all normal ways without discomfort. He has now entered upon the stage of the disease in which it is of the greatest importance to gauge the amount of injury to the labyrinth by means of the caloric test.

Deductions To Be Drawn from the Caloric Reactions.—

(1) If irrigation of the diseased ear with hot or cold water is followed by normal reactions, we may assume with confidence that the labyrinth has been the seat of a comparatively mild lesion which has undergone resolution, leaving the vestibular structures intact and functioning. Prognosis good.

(2) If, on the other hand, after irrigation, with heat or cold, persisted in from three to four minutes, no caloric reactions are induced, we may conclude that the labyrinth is the seat of a suppurative process which has either destroyed the vestibular structures, or at least has resulted in injury sufficiently severe to have annulled vestibular function or irritability to thermal stimuli. This condition describes the so-called latent stage of suppurative labyrinthitis, in which the ultimate prognosis is grave.

In the minds of many Barany's name seems to be associated chiefly with the caloric tests. To my mind the value of his studies depends equally upon the fact that they have enabled him to establish certain more or less definite, constant relations between vestibular nystagmus and the attendant phenomena of vertigo and ataxia. If we can accept his hypothesis that the same laws govern the spontaneous nystagmus of labyrinthine disease and the induced nystagmus of experi-

mental vestibular irritation, it is evident that we may resume our studies of labyrinthine disease with a surer hand.

Barany's studies have led him to formulate the following laws as governing the spontaneous vertigo and ataxia of vestibular disease:

(a) Spontaneous vertigo of vestibular origin is always accompanied by spontaneous vestibular nystagmus, and is always increased when the eyes are voluntarily turned in the direction of the quick nystagmic movement.

(b) Vestibular ataxia is always accompanied by vestibular nystagmus, and is always influenced by the position of the head.

(c) A person having vestibular nystagmus tends to move in the plane of the nystagmus and to fall in the direction opposite to the quick nystagmic movement.

If, as Barany believes, these are constant relations between the three components of the symptom complex characteristic of acute labyrinthine disease, it is obvious that we have control tests by which we may gauge the value of single symptoms. Thus vertigo which is not accompanied by nystagmus even when the eyes are turned strongly in the direction away from the suspected labyrinthine lesion, and which is not influenced by the position of the eyes, has little value as pointing to labyrinthine disease. Disturbances of equilibrium which are not influenced by the position of the head, can hardly be assumed to be of vestibular origin.

Let us re-state briefly the laws governing vestibular ataxia, and test their value as applied to the ataxia following the rotation, or turning, experiment.

1. Vestibular ataxia is always influenced by the position of the head.

2. A person exhibiting vestibular nystagmus tends to move within the plane of the nystagmus and to fall in the direction opposite to that of the quick nystagmic movement.

It seems to me that we shall obtain a clearer understanding, and avoid apparent contradictions, of the latter rule, if it be made to read as follows:

A person exhibiting vestibular ataxia tends to rotate within the plane of the nystagmus and in the direction opposite to that of the quick nystagmic movement.

This tendency to rotation is about an axis passing through the patient's head, and he falls or tends to fall only as this

rotation, modified by his contact with the earth, throws his body in one or the other direction.

Let us now observe a person who, seated with head erect, has been turned ten times to the right. When the rotations are suddenly stopped, he exhibits well marked horizontal nystagmus to the left. He also experiences vertigo. Let him at once stand and, with head still erect and feet closely approximated, close his eyes. The nystagmus being in the horizontal plane, the reaction movement should be, not falling, but gradual turning in the horizontal plane to the right (Fig. 4). This, however, may not be demonstrated, i. e., he may stand quietly. Let us investigate the first rule which declares that vestibular ataxia must be influenced by the position of the head. Direct him to bend the head forward to an angle of 90° so that the face looks directly downward. The plane of the nystagmus is now changed from the horizontal to the vertical, and the nystagmus being to the left, the head tends to rotate in the opposite direction, i. e., toward the right shoulder. This, however, throws his body to the left. That this contradiction of the rule that the patient usually falls or moves in the direction opposite to the quick nystagmic movement, is apparent rather than real, is made clear by the accompanying diagram (Fig. 5).

If he had bent his head directly backward to an angle of 90° , instead of forward, he would inevitably have fallen in the opposite direction, as shown by Figure 6.

Another example may be cited in the rotary nystagmus following the caloric tests, or that occurring in acute labyrinthitis. Here the plane of the nystagmus being vertical rather than horizontal, the patient standing with head erect, falls in the direction opposite to the quick eye movement. And since in suppurative labyrinthitis the nystagmus is almost invariably toward the sound ear, it is perfectly correct to say that he falls usually in the direction of the diseased ear. It must not be forgotten, however, that in certain forms of circumscribed, irritative labyrinthitis, the nystagmus is in the direction of the diseased ear, in which case the patient would of course fall, or tend to fall, in the direction of the sound ear.

The other contention of Barany,—viz., that vestibular vertigo and vestibular ataxia are invariably accompanied by some degree of vestibular nystagmus,—is of decided clinical importance. So far as the phenomena induced by the rotation and caloric tests may be relied upon, this contention is substan-

tiated. In my experience these experiments have in normal persons been invariably followed by vertigo and ataxia, usually pronounced, and by nystagmus, and in no case have the vertigo and ataxia been found to persist after the nystagmus has disappeared. I have personally never seen a case of labyrinthine disease in which vertigo and ataxia have persisted after disappearance of the nystagmus.

Naturally where one has so often to deal with hysterical and neurasthenic patients suffering from intercurrent aural disease, one may meet with apparent contradictions to any law dealing with subjective symptoms (e. g., vertigo) or with objective symptoms which may be under the unconscious influence of the will (e. g., disturbed equilibrium). It is now an established fact that many neurasthenic patients exhibit under certain conditions certain peculiar, uncontrollable eye movements which are not of vestibular origin and in no way resemble vestibular nystagmus. In like manner, it is obvious that vertigo and apparent disturbance of equilibrium may in neurasthenic patients depend wholly upon functional disorders of the general nervous system.

The far-reaching influence which Barany's theories, if accepted, must exert upon our conception of labyrinthine disease is emphasized when we consider their points of divergence from the theory and practice of von Stein. Barany holds that disturbance of equilibrium is characteristic only of the acute stage of labyrinthine diseases, and that it regularly disappears as the lesion advances either toward resolution or toward destruction of the vestibular structures. This view is supported by the fact that vestibular ataxia as a subjective symptom rapidly disappears after surgical destruction of the labyrinth. Barany therefore attaches little importance to disturbed equilibrium as a diagnostic sign in the latent or chronic stage of suppurative labyrinthitis.

Von Stein has elaborated exhaustive methods of eliciting symptoms of disturbed equilibrium requiring according to his own statement one or even three hours for the thorough examination of a single patient. Since such an examination would be quite impossible in the acute stage of suppurative labyrinthitis, it is clear that von Stein regards his tests as appropriate to the later, or chronic, stage of the disease.

Barany believes that in the chronic stage of suppurative labyrinthitis, the vestibular apparatus is in the great majority of cases no longer responsive to the usual stimuli (i. e., that

its function is abolished), and that it is therefore illogical to expect disturbance of equilibrium as a result of disease localized in an organ which is not essential to static or dynamic equilibrium, and which, moreover, is no longer irritable.

Von Stein apparently believes that at no stage of suppurative labyrinthitis are disturbances of equilibrium absent; and that while these disturbances may not interfere with the patient's ability to walk or stand normally, they may be clearly demonstrated by requiring him to perform certain acts in which he is not practiced by daily custom, e. g., jumping or hopping with eyes closed, standing alternately on one and the other foot, standing on an inclined plane, etc, etc.

A possible error in all such tests lies in the fact that different individuals, depending perhaps on differences of age, muscular strength, general physical condition or, if you please, upon physiologic variations in the normal power of static or dynamic control, may when called upon to perform any unusual muscular feat, exhibit apparent disturbances of equilibrium which can not properly be referred to any organic lesion.

It is now generally conceded that vestibular ataxia is a symptom induced by vestibular irritation, acting either upon the diseased labyrinth, or by ablation of its function through disturbed balance of the unopposed healthy organ; and further that it disappears as a subjective symptom after the diseased labyrinth has been destroyed surgically, or its function (i. e., irritability) completely annulled. If, therefore, von Stein's tests elicit a veritable vestibular ataxia in the chronic stage of labyrinthine suppuration, we must assume that it is due, not to irritation of the diseased and non-functioning labyrinth, but to excitation of the sound labyrinth which is no longer balanced by an opposed healthy organ. But if von Stein's tests give positive results only by reason of ablation of function in the diseased labyrinth, why should we resort to so uncertain and exhausting an examination when far more definite data may be obtained by so simple a procedure as the caloric test?

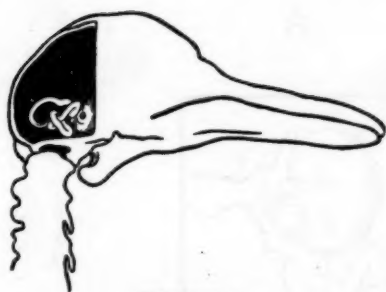


FIGURE 1.

Horizontal semicircular canals of pigeon (after Ewald).

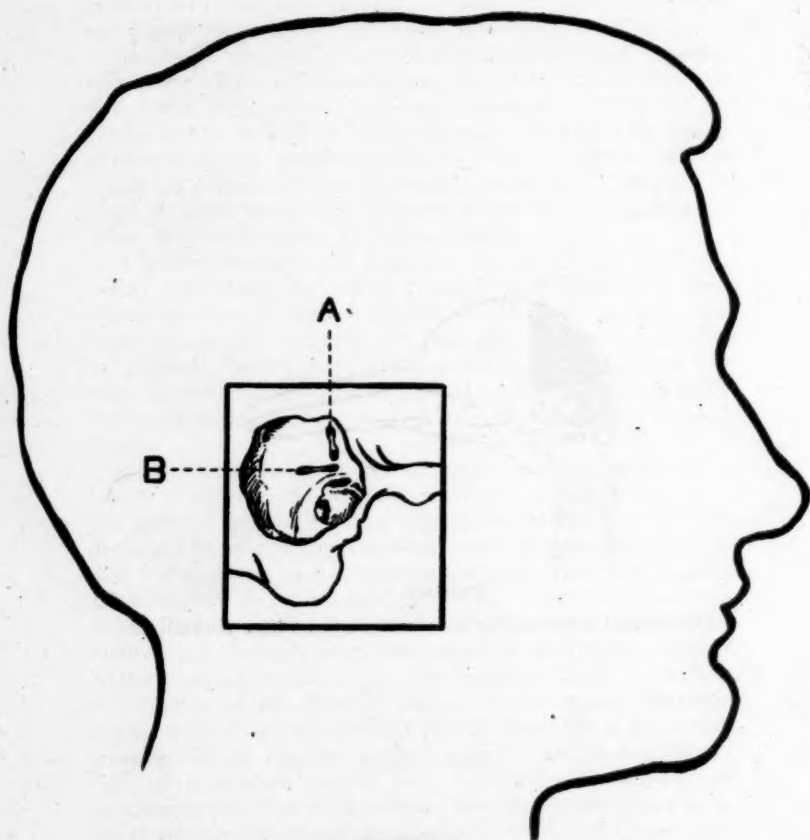


FIGURE 2.

A, Anterior vertical canal. B, Horizontal semicircular canal.

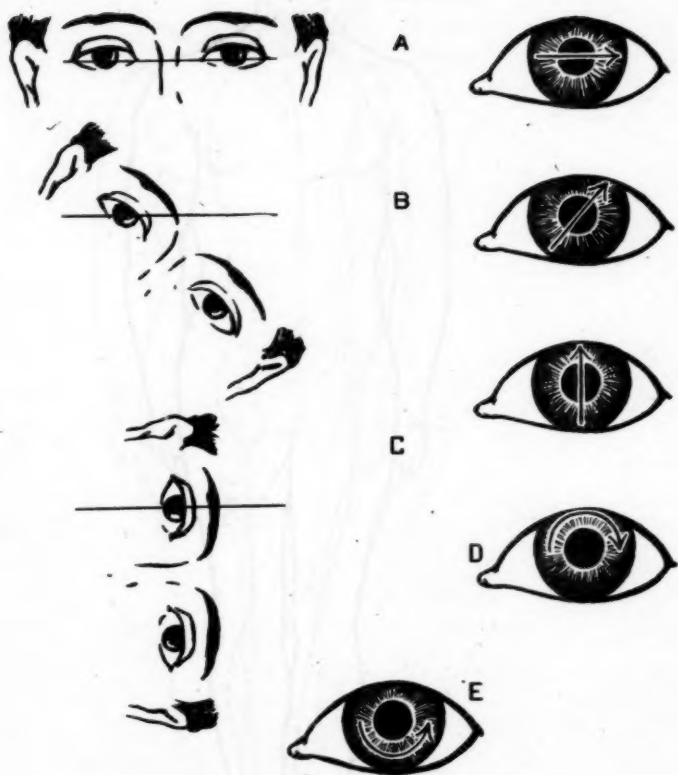


FIGURE 3.

Showing various forms of nystagmus following rotation. A, horizontal; B, oblique; C, vertical; D and E, two types of rotary nystagmus.

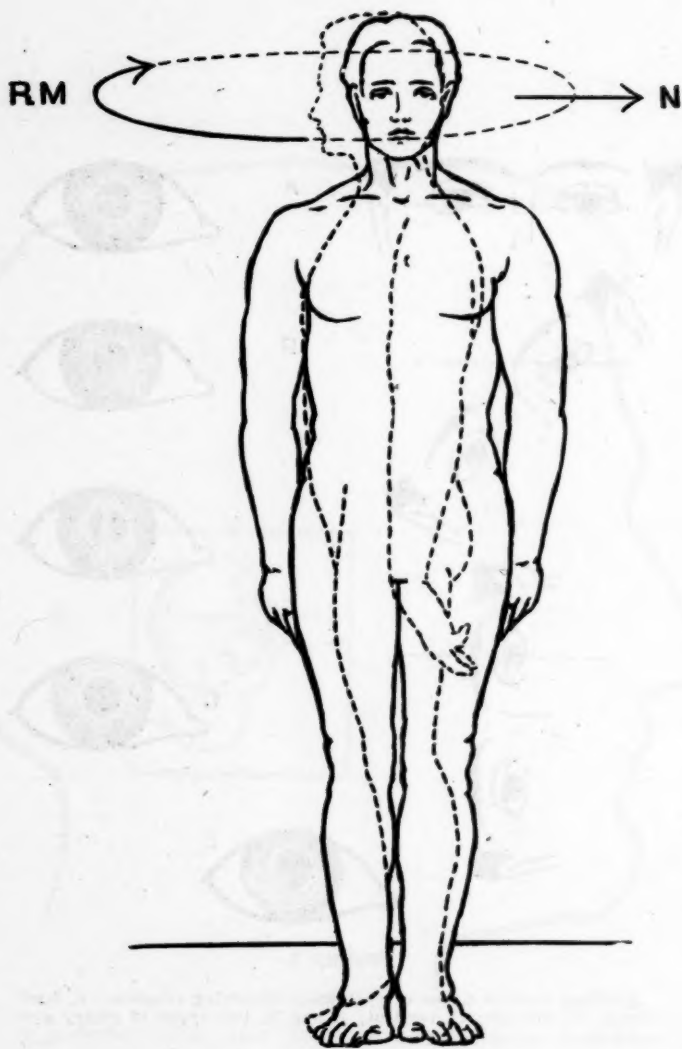


FIGURE 4.

Illustrating ataxia, or reaction movement, accompanying vestibular horizontal nystagmus, the head being held in the erect position.

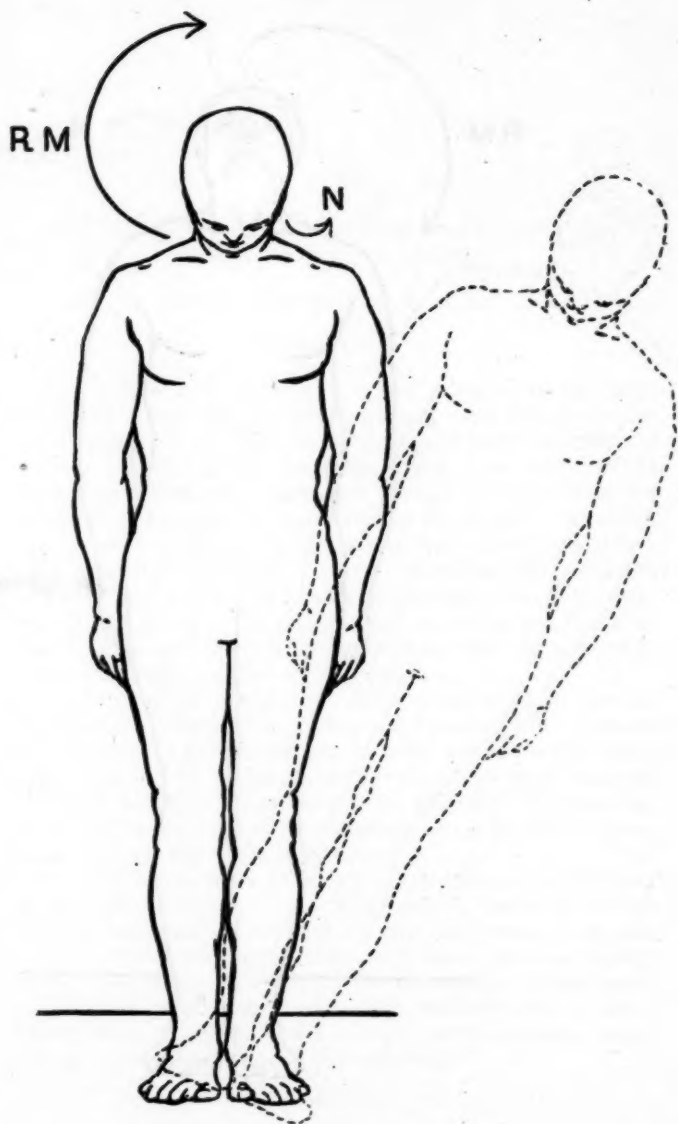


FIGURE 5.

Illustrating ataxia and reaction movement accompanying horizontal vestibular nystagmus, with the head bent directly forward to an angle of 90° with the vertical.

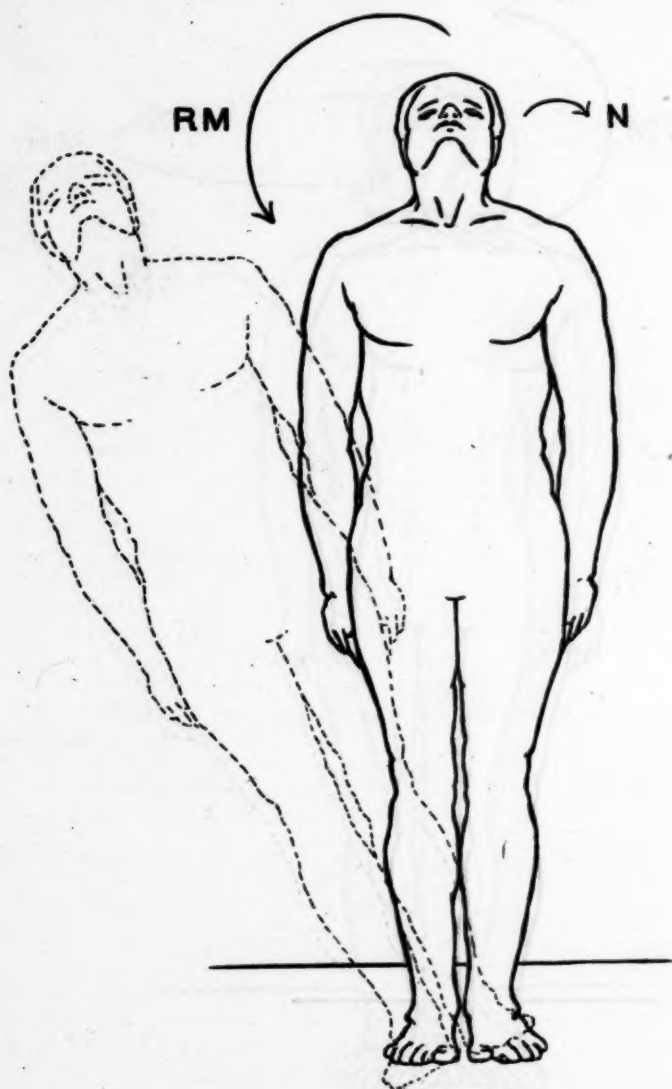


FIGURE 6.

Illustrating the reaction movement—i. e., direction of falling—
accompanying horizontal nystagmus, the head being bent directly
backward to an angle of 90° with the vertical.

XXXV.

NECROSIS OF THE COCHLEA—REPORT AND
ANALYSIS OF A CASE.*

BY ALFRED MICHAELIS, M. D.,

NEW YORK.

At the outset it must be said that necrosis of the bony labyrinth of the ear is a condition not very frequently encountered. Up to the year 1886 Bezold had been able to collect records of but forty-one cases from the world's otological literature. Theophile Bec, in 1894, published a brochure at Lyon—"De la necrose du Labyrinthe"—in which the number of cases collected was but sixty-five—still a very measurable number. Albert Oesch, in 1898, collected and discussed all reported cases of necrosis of the labyrinth, within the limits of an inaugural dissertation published at Basel. This also indicates no very great addition to the figures of Bezold and Bec.—(78.)

A survey of the literature in the last decade since Oesch's collation is productive of a very small increase in the number of reported cases. Gerber, in 1904, added twelve cases, some observed by himself and the rest being cases reported by other aurists. Since then there has been no great increase to Gerber's list of ninety cases. Reports of local hospitals indicate the same infrequency.

It seems worth while to report to you this case of necrosis of the labyrinth, or to be more specific, necrosis of the cochlea, not only on account of rare occurrence, but also because of the questions which such cases have invariably raised—questions dealing with the physiology of the internal ear, and about which some observers are still at odds. Foremost among these is the question of the auditory function in cases of necrosis of the labyrinth.

ETIOLOGY.

Necrosis of the labyrinth is almost without exception, a consecutive condition. There are on record two or three cases of primary necrosis, but doubt has been cast on the

* Read before the Otological Section, New York Academy of Medicine, January, 1909.

genesis of even these. That it is necessarily a slow process cannot be gainsaid. It may be set down as a pretty well fixed rule that chronic purulent otitis media usually precedes and accompanies necrosis of the labyrinth; and it is furthermore conceivable that when this chronic purulent otitis has had indifferent treatment, or possibly none, conditions are established which predispose to extension of the middle ear disease to the labyrinth.

The improved methods of treatment of middle ear abscesses on the one hand and the growing regard of the laity for the gravity of this aural disease, will no doubt make for an even rarer occurrence of necrosis of the labyrinth.

SYMPTOMS.

There are certain symptoms arising in the course of a chronic purulent otitis which point to the invasion of the labyrinth. They are vertigo, facial paralysis, pain, a fetid discharge, and the rapid growth of granulations and polypi. Increased deafness is usually not noted, because the hearing has suffered before from the middle ear disease; and the graver symptoms of the invasion of the internal ear draw away attention from this symptom, especially if the other ear is normal.

It is perfectly possible to have some of these symptoms in the course of a middle ear abscess without any lesion of the labyrinth. After all, the thing that certifies the diagnosis is the extrusion of some part or all of the bony labyrinth. Destruction and sequestration of the entire labyrinth is rare, and seems to have been encountered in children only. In adult life the sequestrum consists most frequently of a portion of the inner framework of the cochlea, usually the first one or two turns. Cases of exfoliation of the semi-circular canals, or of the vestibular portions of the bony capsule are also recorded, however. The preponderance of cochlear sequestra over other portions has led Bezold to conclude that the most common points of invasion of the labyrinth are below—namely, the round window, or via the variable cells on the floor of the tympanic cavity below the promontory.

It is needless to add that such an invasion of the labyrinth at all times constitutes a grave menace to the life of the patient. The wonder is that the mortality for the cases recorded was not greater, only 16 or 18 per cent having succumbed to meningitis, brain abscess, etc.

HISTORY.

Prefaced by these brief and elementary remarks, we come now to the consideration of the case:

F. K., a vigorous young man of 26 years, was referred to me for treatment about two years ago. His own history and that of his family was good. At the age of 14 he had diphtheria, which was followed by discharge from his left ear. He has no recollection that the right ear was also involved at that time. Two years ago he discovered that the right ear was also discharging. As he lived in a small community near New York, the aural condition received scant attention. His hearing had been poor all these years. A week or two after the right ear began to discharge he began to have intolerable pain on this side. The pain radiated to the temporal and supraorbital regions, and completely disabled the patient. The intensity was undiminished for three weeks. This attack compelled him to seek relief and he was told he had a growth in his ear. The local physician made some attempts at removal.

At this point the patient came under my care and observation. He came for relief from the pain on the right side. In view of the more urgent symptoms his hearing was not tested at this time. The physical examination of the right ear disclosed this condition: Canal almost filled with granulations and polypi, with ill-smelling pus oozing from the interstices between the polypi. According to regional origin there seemed to be three groups of polypi—an anterior, a superior, and a posterior group.

The left ear was also discharging foul pus quite freely. There were no granulations or polypi, and the entire drum was destroyed with the exception of a narrow falciform border above. The denuded malleus handle, not adherent, projected downward into the cavity. The mucous membrane lining of the tympanic cavity was greatly thickened, and pus proceeded from the spaces above the cavum tympani.

Cleansing and curative treatment was instituted for the left ear, and the work of removing the granulations and polypi from the right side was begun at once. Since the patient lived at some distance he was seen but once a week, and hence the work of removal extended over five or six weeks. The anterior and superior groups were entirely ablated during this time. It could then be determined that

the anterior group of granulations originated at the lower end of the malleus handle. The upper group sprang from the epitympanic space posterior to the malleus. The posterior group proceeded from the inner wall of the tympanic cavity in the promontorial region. The last mentioned group resisted treatment. What seemed to be the base of the growth was removed in as many weeks. At each examination a growth of considerable size was found to have recurred. It was crater-like in appearance. When removed for the third time the entire base was cauterized with chromic acid. Roughening of the underlying bone could be felt at this time. The ear was clear of all growth, and the discharge had diminished noticeably. No recurrence of growth was observed when the patient returned a week later. Discharge had almost ceased and a whitish mass the size of a small pea could be seen lying on the floor of the cavum tympani. It was easily lifted out and proved to be a fragment of carious bone, which from its conformation was plainly a portion of the cochlea. There was a depression now where the base of the recurring polypus had been. It felt soft and boggy to the probe. All this time the pain had diminished in intensity and by the time the ear had been cleared of growth it had disappeared entirely.

The appearance of the right ear was as follows: The malleus was dislocated downwards and adherent to the inner wall. The drum anterior to the malleus was preserved but also adherent. The posterior half of the drum was gone. The prolapse of the malleus and the adhesions around its neck and head had almost entirely shut off all access to the accessory spaces above. There was only a pin point opening posterior to the malleus, and a slender probe could be inserted only for a limited distance. On the inner wall, in the promontorial region, there was a boggy depression still raw looking. The long process of the incus was gone, and the other parts of that ossicle could not be discovered through the small orifice leading up. Dry treatment was instituted, and for six months after this the patient had no further trouble. Discharge on the left continued in spite of treatment.

At the end of the six months the right ear began to discharge again. The pus proceeded from the small opening above, and there was a tendency to granulation at this

point. Treatment was again resumed and at the present time the ear is absolutely dry, and the epidermization of the tympanic cavity is complete. The fossa rotunda is visible, and 3-4 mm. anteriorly is a pit marking the point of exit of the sequestrum.

THE SEQUESTRUM.

The sequestrum consists of that part of the modiolus cochlearis of the first cochlear turn. The basis modioli with its central canal for the cochlear branches of the auditory nerve may be seen, and the lamina ossea spiralis is also present. The two scalae are plainly visible. Height 2 mm., and the greatest width is 4 mm.

AUDITORY TESTS.

Hearing tests were conducted immediately after this unexpected exfoliation of a part of the cochlea. The tests were made with Hartmann's series of forks, and were entirely qualitative.

Right Side.			Left Side.		
	Air.	Bone.		Air.	Bone.
C 32.....	Neg.	....	C 32.....	Neg.	....
C 128.....	Neg.	Pos.	C 128.....	Pos.	Pos.
C 256.....	Neg.	Pos.	C 256.....	Pos.	Pos.
C 512.....	Neg.	Pos.	C 512.....	Pos.	Pos.
C 1024.....	Pos.	Pos.	C 1024.....	Pos.	Pos.
C 2048.....	Pos.	....	C 2048.....	Pos.	....
Watch.....	Neg.	Pos.	Watch.....	2½ cm.	Pos.

Weber's Test: Conducted with C 256 yielded lateralization to the right side distinctly, accompanied by a "buzzing sound," to use the patient's language.

It was discovered by accident whilst testing with C 256 that the patient could hear this fork on the right side when applied quite lightly even, to any part of the external ear. The bone conduction for the watch was better on the left than on the right side. Further tests conducted about six months later, in the main confirmed the original results. The patient again lateralized to the right, and again the tone of C 256 was accompanied by a buzzing sound.

- C 128 heard when applied to auricle.
- C 256 heard when applied to auricle.
- C 512 heard when applied to auricle.

Galton, 1.06—both sides.

Koenig's rods—41,000.

Loud voice, 25 cm.

Acumeter, $2\frac{1}{2}$ cm. right, 65 cm. left.

Final hearing tests were made last July, with the following results:

Right.		Left.	
	Air. Bone.		Air. Bone.
C 26.....	Neg.	C 26.....	Neg.
C 128.....	Neg. Plus.	C 128.....	Plus. Plus.
C 256.....	Neg. Plus.	C 256.....	Plus. Plus.
C 512.....	Plus. Plus.	C 512.....	Plus. Plus.
C 1024.....	Plus. Plus.	C 1024.....	Plus. Plus.
C 2048.....	Plus.	C 2048.....	Plus.

Lateralization again to the right side, together with a "buzzing sound."

C 512 } all heard on the right side when lightly applied
 C 128 } to auricle of that side.
 C 256 }

Right.	Left.
Watch—Air, neg.	Watch—Air, 5 cm.
Watch—Bone, plus.	Watch—Bone, plus.

Watch heard louder on the left by bone than on the right.

Speech: Some words spoken in middle voice were heard at 2 meters. Loud voice $3\frac{1}{2}$ to 4 meters. This applied to both sides.

On testing bone conduction for duration, the following resulted:

Right.	Left.
C 256..... 14 seconds.	C 256..... 16 seconds.
C 512..... 22 seconds.	C 512..... 28 seconds.
C 1024..... 12 seconds.	C 1024..... 16 seconds.
Galton whistle, 2.5.	Galton whistle, 1.2.

ANALYSIS.

Let us revert to the symptoms of necrosis of the labyrinth stated at the beginning of this paper. The presence of pain has been noted. The occurrence of profuse and fetid discharge was also mentioned in the history. The polypi and granulations recurred rapidly after each removal, and this fact has been noted in many of the cases on record. There remain but two symptoms stated at the outset, of which no mention was made in detailing the history of the

case—vertigo and facial paralysis. It is evident that these two symptoms could not have been very prominent, or were wanting entirely, since no allusion has been made to them. The patient does not remember to have had trouble with his face at any time. On the other hand, he remembers to have had three or four transitory attacks of vertigo, at about the period of the subsidence of the pain. The vertigo ensued when he picked up some weighty object, and there was a slight tendency to fall toward the right. There never was any actual fall, however.

It seems, then, that with the exception of facial paralysis present in 80 per cent of all cases, all the symptoms commonly noted were present. The patient dated the onset of his trouble on the right side only two years back. It is not unlikely, however, that the purulent middle ear disease was present long before this. Certainly the polypi could not have developed to so great an extent in the two or three weeks between the onset of the pain and the examination of the ear. We have to deal here undoubtedly with a neglected middle ear abscess.

Thus the conditions of chronicity and an antecedent middle ear suppuration are satisfied. There is no way of determining when the invasion of the labyrinth took place. In any event the death and sequestration was not a rapid process.

When we review and analyze the results of the tests for hearing we arrive at the most interesting and important feature of this report. Most observers have come to the conclusion that an ear whose cochlea has suffered destruction, even in part, as in this case, has lost its power to hear.

The consensus of opinion is that the sound ear does all the hearing, and that it is impossible to exclude this ear from participation when the side whose labyrinth is destroyed is tested. Failure to recognize this fact has led some observers to ascribe hearing power to ears whose labyrinths were destroyed.

If we refer to the last tests made upon the case here reported we note, taking up the question of air conduction first, that the voice was apparently heard up to four meters by the right and left ears when tested separately. Both ears were now closed and the right side tested again, and again the right side apparently heard the selected words at four

meters. Thus by means of this test, known as the Denert-Luca test, one proof is adduced that speech could not have been independently heard on the right side.

The same test was employed when air conduction was tested with the tuning forks. The forks were heard just as well when the right side was closed.

It will be noted that the higher notes, C 512; C 1024 and C 2048, were heard by air conduction on the right side. This, of course, is contrary to all experience, and contrary to the accepted fact that in nerve deafness, of which this is an example, the higher tones are not heard. But we know that all the treble tones whose wave lengths are short have greater penetration and are harder to shut out from the untested ear. In this way we may explain what seems a departure from accepted laws for determining auditory nerve involvement.

When we come to analyze the tests made for bone conduction we must recall to mind that if it was difficult to exclude the sound ear in air conduction, it is impossible to exclude it from participation when bone conduction is tested.

Weber's test, which at the best is not always conclusive, yielded rather mystifying results. The patient with great positiveness referred the preponderance of sound to the right side, stating that it was a "buzzing sound." He also claimed to hear all the forks that were applied to the right mastoid bone at the point of application, and not on the other side. The writer was particular to elicit this information. The patient was very positive in his assertion. If we add to this the fact that some forks were heard on the right side even when placed lightly anywhere on the right auricle, our conclusions appear to be still more confused.

The phenomenon of the "buzz" which the patient claims to have heard when the lower forks in the series were applied to the mastoid or vortex seems almost to fortify the theory maintained by some that the labyrinth has sound perceiving and organs other than the cochlear ones. The theory that the maculae acusticae of the vestibule have the function of perceiving noises seems to gain support by the assertion of the patient, that a buzz was heard with or instead of a tone.

It does not need to be emphasized that tones or even

noises other than the tonal vibrations enter into the sum total of sound of most forks and particularly those of the lower and middle register. In other words, there is a mixture of essential tone and adventitious sounds and noises. Bearing this fact in mind and also recalling that in this particular case, both from the symptoms and pathology, there was apparently no involvement of the vestibular part of the labyrinth which contains the maculae acusticae, we might reasonably conclude that the maculae had exercised their supposed noise-perceiving function when the forks were applied. The perception of the pure tonal vibrations was, however, eliminated since Corti's organ was destroyed. This deduction would seem justified both by the macular theory and by the nature of the case described. In the light of the still unshaken theory of Helmholtz this deduction, whilst fascinating, is purely fanciful.

There is little question that the delicate membranous labyrinth, and especially the cochlear contents, cannot possibly survive when the bony envelope or framework is destroyed, and most physiologists are agreed that the cochlea is the sole tone-perceiving and tone-analyzing portion of the membranous labyrinth.

The only tenable conclusion is that the sounds which are seemingly perceived on the side whose labyrinth is destroyed are only the expression, in a diminished degree, of what the opposite ear is able to hear.

That this is so Bezold was able to prove by tests for duration of hearing by bone conduction, and the results obtained, when this case was tested for duration, support his conclusions. The duration in seconds on the right side was less than on the left side. The lesser duration on the right is due to loss by penetration to the opposite side. The improvement in hearing on the left side which was noted at each successive test also gave rise to an apparent improvement on the right side. That the patient referred sound perception to the right side in all of the bone conduction tests can only be explained by his inability to localize the sound.

XXXVI.

SUPPURATION OF THE LABYRINTH.

BY LAFAYETTE PAGE, A. M., M. D.,

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The labyrinthine capsule, containing the delicate and wonderful mechanism for the perception of sound, combined with the equally wonderful organ of equilibration, is well adapted for protection against the invasion of disease. The fact that the labyrinth is so rarely invaded by the purulent process, which is so often present in the tympanic cavity, bathing its outer wall in pus and the products of decay, is evidence that nature has afforded unusual protection for these organs. Bezold estimated that the labyrinth is involved in the necrotic process in the proportion of only one case in every five hundred of chronic purulent otitis media, while Friedreich estimates the proportion to be one in every one hundred. The percentage of involvement is probably greater than either of these estimates. Since the great majority of cases of labyrinth suppuration occurs during the first decade of life, many of them pass unrecognized. Until quite recently our knowledge of this affection has been in a very chaotic state. The symptomatology has been ill defined. The difficulty which the investigators have encountered in ascertaining the physiologic functions of the cochlea and the vestibular apparatus with their disturbed functions in pathologic processes has rendered diagnosis uncertain. The recent and concentrated effort among otologists to master these difficult problems of diagnosis has been well rewarded. We now feel that we can base our diagnosis on tests and well defined symptoms and outline the treatment or surgical procedure with a degree of certainty that places this subject well within the realm of exact science.

MODE OF INVASION.

The most vulnerable points in the labyrinth wall are the horizontal semicircular canal, the fenestra ovalis and rotunda and the pars promontoria; and from within, the porus acus-

ticus internus is the most frequent avenue of infection. The fenestrae present the greatest structural weakness to invasion. The horizontal semicircular canal is regarded by Jansen as the most frequent site of infection. This is due to the close relationship of the attic, the chief seat of pathologic activity in chronic middle ear suppuration. Friedreich emphasizes the importance of the oval window as an exceedingly vulnerable point, owing to the frequent granulosomatous changes about the foot-plate of the stapes, destroying the annular ligament. The intimate vascular connection between the lateral and petrosal sinuses and the labyrinth render infection possible along these venous channels by metastasis, without producing fistulous openings in the outer capsule (Richards). The accumulation of septic material about the oval and round windows and the horizontal semicircular canal from pathologic processes in the middle ear, producing granulosomatous changes and gradual erosion from without, is the most common mode of infection of the labyrinth. When the infectious process has once gained entrance to the vestibule or cochlea, the destructive changes are rapid, and the spread of the disease to the brain is easy along the course of the facial and auditory nerve sheaths, and the saccus endolymphaticus.

SYMPTOMS.

Marked or well defined symptoms of labyrinth suppuration are present only in those cases of rapid or sudden invasion. When the process of erosion takes place slowly, the vestibular functions are gradually accommodated to the changes, so that manifest symptoms are not always observable. In a large percentage of cases in which the labyrinth is extensively destroyed, there are no characteristic symptoms to direct our attention to the labyrinth, as the seat of disease. Such symptoms as nausea, vomiting and disturbed equilibrium are not sufficiently characteristic to more than suggest involvement of the labyrinth. They may all be present in intratympanic disease, cerebellar abscess or cholesteatoma. Any affection from without, disturbing the intralabyrinthine pressure, may produce these symptoms, as we have all observed. Profound deafness, occurring suddenly, is always suggestive of involvement of the cochlea in the purulent process; tinnitus and the various hallucinations of sound are suggestive symptoms. Bezold and Friedreich both regard disturbed equilibrium as

the most constant symptom in this affection. Nystagmus, with nausea and vomiting, they consider very transient phases of the disease. In the active diffused form of a purulent involvement of the labyrinth, the symptoms which are usually present are nausea, vertigo, nystagmus, headache, slight fever and coated tongue. If the patient attempts the upright position, disturbances of equilibrium are very manifest, especially when standing with eyes closed and feet together. Having these symptoms, including profound deafness and tinnitus, we can feel quite sure of labyrinth involvement (Jansen). In the typical cases the diagnosis is obtruded upon us, but in the large percentage of chronic cases, in which the process is circumscribed and latent, we may be caught unawares.

Barany has recently discovered, by numerous tests, that in every man possessing a normal vestibular apparatus, on syringing the ear with cold water there is produced a distinct nystagmus, which lasts from one-half to three minutes. If the right ear is syringed with cold water, the head being in the upright position, there is produced a rotary and horizontal nystagmus, directed toward the left side and is best observed when the patient looks to the left side. If the water is of the temperature of the body, no nystagmus is produced. If water of a temperature higher than of the body is used in syringing, the nystagmus is reversed; that is, the nystagmus is directed toward the ear which is being syringed. This test reveals the normal reaction of the vestibular apparatus to heat and cold. Now if the semicircular canals are destroyed, syringing with cold water produces no nystagmus, so the reaction is negative. In a circumscribed labyrinth suppuration, canals not destroyed, such as fistula of the labyrinth, the nystagmus is to the diseased side. In an acute diffused labyrinth suppuration, in which the functions of the labyrinth are suddenly paralyzed, syringing the diseased ear produces no nystagmus. Spontaneous nystagmus is to the sound side. In old cases of diffused labyrinth suppuration the reaction from cold is negative, and there is no spontaneous nystagmus.

Barany calls our attention to the number of reported cases of death from meningitis following the simple radical mastoid operation—patients who were strong and healthy, except perhaps for an occasional attack of vertigo. The post-mortem of such patients always showed the presence of an undiagnosed labyrinth suppuration, which after the radical operation produced fatal meningitis. He further says that when the diag-

nosis is clear, every case of such suppuration should be operated on radically and the labyrinth itself opened at the same time. This test is a great contribution to our diagnostic methods. Its value is not confined alone to the diagnosis of suppuration of the labyrinth, but is of great value in cerebellar abscess and acoustic tumor.

The equilibrium tests are of decided diagnostic value in some cases. To state them briefly: "First, standing with open and then closed eyes, to note the unsteadiness of position; second, walking with open and then with closed eyes, noticing a tendency to ataxic gait or divergence from a straight line, a tendency to walk in a curve generally; third, jumping, feet and knees in apposition and eyes closed, to ascertain any tendency to fall toward the affected side; fourth, the rotation test, by turning the patient rapidly on a revolving chair and suddenly stopping. The rotation should first be toward the sound side, and then toward the diseased side. The sensation of giddiness is most marked when turned toward the affected side."

These tests are not of so much practical value in clinical practice as the caloric test. Our patients are not usually willing to submit to these undignified gymnastics called for in equilibrium tests, especially if they happen to be suffering from the unpleasant symptoms of the disease. The galvanic test is rarely used at the present. The tuning fork tests are generally conceded to be of doubtful value in the diagnosis of this affection. Bone conduction is usually impaired; the range of audition is greatly reduced; the upper tone limit is lowered, and the lower tone limit is elevated. The Weber test is lateralized in the normal ear. Rinne is negative.

The value of many of these tests depends largely on the personal equation. The difficulty of using these tests for diagnosis in very young children is obvious.

Barany says the life of the patient may depend upon an accurate investigation of the functions of the labyrinth, and the experience of all those who have operated on these cases would verify this statement. In testing the hearing of those who have had the labyrinth partially or completely destroyed, one of the most difficult problems which we have had to encounter is in successfully eliminating the hearing in the normal ear. With all the devices which have been contrived for this purpose, it has been practically impossible to occlude the good ear. Professor Voss, of Frankfurt, Germany, in the current

number of the *Beitraege*, describes a device which seems to successfully occlude the hearing in the normal ear. Without fully detailing this test, it consists in directing a current of compressed air against the drum membrane of the normal ear, while we are conducting our hearing test in the affected ear. The compressed air forces the drum and stapes inward, increasing the intralabyrinthine pressure to the point of producing total deafness in the good ear. It remains to be demonstrated if this is an absolute test.

PROGNOSIS.

The prognosis of suppuration of the labyrinth is not so utterly hopeless as the location of the purulent process would lead us to expect. In spite of extensive necrosis, approaching very near the dura, the internal carotid and the jugular, complications producing death are comparatively rare. Nature is ever on her guard, erecting barriers around sequestra and osseous fistulae, preventing the advance of the disease with proliferations of connective tissue and osteosclerosis.

"Fatal termination is usually due to the extension of the carious process to the facial canal, the cranial cavity and the venous sinuses, resulting in death from meningitis, abscess of the brain, sinus thrombosis and phlebitis. Erosion of the walls of the carotid canal and lateral sinus may terminate in fatal hemorrhage or general pyemia."

INDICATIONS FOR OPERATION.

To determine the necessity for operation in these cases requires the best surgical judgment. We should hesitate to invade this dangerous region until the indications become imperative. Richards has well defined the proper surgical attitude in these cases, in the following statement: "Considering, however, the doubtful value of symptoms as indicative of actual invasion of the labyrinth, the difficulty of eliminating cerebellar disease, the unreliability of tuning forks in differentiating, in this class of cases, middle ear from labyrinthine lesions, the practical certainty that we will destroy the organ for the purpose of useful hearing, the actual danger to life should we commit the error of opening a normal labyrinth to an infected cavity—the correct surgical attitude is not to enter the labyrinth upon symptoms, etc., alone at the primary operation, unless there is direct evidence that the labyrinth is involved."

These words were written before the Barany method of testing the functions of the labyrinth were perfected. While this advice would probably be modified in some degree from the light thrown on this subject by the very recent discoveries, yet it indicates the proper course, even now, for those who have not had wide experience in operating on these cases. Reckless exploration of the labyrinth certainly endangers life. Jansen says that the labyrinth operation is permissible in every diffused infectious disease of the entire labyrinth or of one of its two portions, especially of the vestibule. He also emphasizes the necessity of operating in all cases of accidental luxation of the stapes, following currtment, in which the following symptoms develop after twenty-four hours following the radical mastoid operation: rise of temperature, coated tongue, increasing nystagmus and equilibrium disturbance.

Jansen represents the most extreme radicalism in surgical treatment of this disease. For those who do not possess such skill and wide experience, the more conservative course is the wiser.

METHODS OF OPERATION.

As has already been pointed out, many cases of suppuration of the labyrinth are not discovered until the radical mastoid operation reveals fistulous openings in the outer labyrinthine capsule. The primary step in every operation on the labyrinth is the complete exposure of the tympanic cavity and horizontal semicircular canal, by the radical mastoid operation. If the vestibule or cochlea are to be opened, the widest exposure possible within the limits of safety is necessary. Owing to the great variations in the anatomical relationships of the labyrinth to the facial canal, the sigmoid and petrosal sinuses, the jugular bulb and the carotid canal, our course must be modified to suit these varying structural relationships. Every operator must choose his course to suit the anatomical variation. After the tympanic cavity has been thoroughly exposed, the wound should be packed with gauze, soaked in adrenalin, until the field of operation is perfectly clear of blood. If it is discovered that the canals are the seat of the carious process, they are removed by gradually shaving away with chisel or burr as far as the ampullary openings into the vestibule, keeping in mind all the time the close relationship of the horizontal canal to the facial nerve. By this method the vestibule is opened from above and behind the nerve. If the vestibule is found to be involved, a counter opening is made through

the oval window, which is enlarged downward, exercising great care to avoid fracturing the inner wall of the vestibule. Often it will be found necessary to remove the horizontal canal. This will be found comparatively simple and easy. In other cases, a complete exenteration of the canal system is necessary when they are found to be perforated with fistulous openings and contain granulations and pus.

The Bourguet method of opening the labyrinth consists first, in the radical mastoid operation, thoroughly exposing the tympanic cavity and curretting the tympanic end of the eustachian tube, then introducing the Bourguet protector into the oval window, so as to protect the facial nerve from injury. The bridge of bone between the oval and round windows is chiseled away with a delicate chisel, thus exposing the vestibule. This opening may be enlarged, so as to expose the interior of the cochlea. The cavity is then gently cleansed of granulations and pus, a wick of gauze placed and the mastoid wound lightly packed with gauze.

I have only indicated the merest outline of the operative technic. There are several modifications of these two methods of entering and exploring the labyrinth.

The following cases will illustrate some of the very interesting phases of this affection:

CASE 1.—E. B., aged nine years, consulted me December 6, 1906, on account of headache, tenderness and swelling over the mastoid and discharge from the left ear. The discharge began six months previous, following an attack of measles, and had persisted since, without pain. In examining this little girl, I was attracted by her intelligence and patience, which enabled me to make a thorough and satisfactory examination. There was a large perforation of the membrana tympani, which was filled with protruding granulations. I could easily detect a necrotic area about the promontory with a fine probe. Loud conversation was apparently heard with the normal ear closed. Weber lateralized in the normal ear; Rinne negative. Nystagmus, vertigo and nausea were entirely absent and had been so from the beginning of the discharge. (The Barany tests were not known at that time.) A radical mastoid operation was performed two days later. There was extensive destruction of the mastoid cells and the tympanic cavity was filled with granulations. After removing the necrotic ossicles and granulation, the cavity was packed for a few minutes with adrenalin gauze, so that the outer wall

of the labyrinth could be carefully explored. A large fistulous opening was found in the promonotory, close to the fenestra ovalis, which led into the cochlea. The outer shell of the cochlea was chiseled away with a small gouge. The interior of the cochlea was filled with granulation and pus and the modiolus with the osseous lamina was found to be completely detached, and was removed en masse as a sequestrum. The cavity of the labyrinth was carefully mopped out with gauze and wick drainage was placed, and the operation completed in the usual way. This was followed by an uninterrupted recovery, and there has been no discharge of pus from the ear since.

We should naturally expect a complete destruction of hearing in this ear, since the cochlea was so extensively removed. Yet, with all the known devices for eliminating the normal ear, such as herpetic sealing, creating a vacuum with pneumomassage, there was apparently a certain degree of hearing in the affected ear for loud conversation. This was also the conclusion of others, who verified the tests. Recently I have used the Voss test for eliminating the normal ear, and find the defective ear completely destroyed for hearing.

CASE 2.—Mrs. L., aged thirty-two, consulted me May 2, 1907, on account of distressing vertigo, headache and high-pitched noises in the left ear, which had been continuous for the past few months. The symptoms had become so annoying of late that she was unable to attend to her household duties. She could not fix the exact time when the discharge began, as it was not accompanied by any marked acute symptoms. She thought she had trouble with that ear in childhood, and that it had been quiescent for several years, with slight tenderness, until discharge began, about three years previous to my examination.

On examining the ear, I found the tympanic cavity, mastoid cells and antrum filled with a very extensive cholesteatomatous mass, the full extent of which I could not fully determine. The membrana tympani was completely destroyed, and pus was flowing all about the deeper portions of the mass.

The radical mastoid operation was advised and performed three days later. After chiseling through a thick mastoid cortex, a large cholesteatomatous mass was exposed, which extended deep into the posterior cranial fossa, near the internal auditory meatus and surrounding the canal system. There was an epidural abscess, and the posterior and hori-

zontal canals were necrotic and in communication with the abscess cavity. The cholesteatomatous mass and granulation tissue were cleared away and the semicircular canals were completely removed as far as their ampullary openings in the vestibule. The Panse flaps were used for lining the cavity and gauze wicks were placed. Equilibrium disturbances were annoying for a few weeks after the operation. Recovery has been complete. Two years have elapsed, without any sign of return of the cholesteatoma or other disturbance of equilibrium.

CASE 3.—On May 16, 1906, Mrs. J., aged fifty-three, consulted me, on account of severe pain about the left eye and a purulent discharge from the nose.

Examination revealed the middle turbinates greatly swollen and pus flowing from the anterior and posterior ethmoid cells of the left side.

One week later, on the 24th, I was called to see this patient, at her home, on account of distressing pain in the left ear and a facial paralysis on the same side. Finding the drum distended, a free incision was made at once, which was followed by a bloody serous discharge. She was sent to the hospital the same day, as marked mastoid involvement was already present. The facial paralysis continued, and on the following day the mastoid was opened and found to be extensively involved in a very active purulent process. The usual simple mastoid operation was completed. Two days later the right ear became involved, with all the symptoms of an active invasion of the labyrinth. Swelling over the mastoid, nystagmus, nausea, vertigo on rising in the bed, profound deafness and high-pitched noises were present. The radical mastoid operation was performed, thoroughly exposing the outer wall of the labyrinth. The region of the oval window and the horizontal canal were examined, for fistula, but the point of invasion of the pyogenic process could not be found, so the operation was completed without opening the labyrinth.

The healing process in both mastoid wounds was slow, and it was with the greatest difficulty that I succeeded in stimulating the granulating process. The facial paralysis of the left side gradually abated, and at the end of two months both wounds had completely healed.

The results have been total deafness in the right ear, while the hearing in the left ear returned to normal. The nystagmus and vertigo persisted for several weeks after the opera-

tion. Considering the great virulence of the infection and the poor vital reaction in this patient, the results have been most satisfactory.

CONCLUSIONS.

Recently most exhaustive tests have been applied to these cases to determine if the labyrinth of the affected ear was in any way functioning. The Barany tests were negative in all three cases for the operated ear. The hearing tests were uncertain. Until the Voss test for eliminating the normal ear was used, it was impossible to determine if a certain degree of hearing did not exist in the operated ear of all these patients.

I am now of the opinion that all reported cases in which it is claimed that any degree of hearing remains after removing a part of the cochlea is a mistake, and if the Voss test for eliminating the normal ear is applied in these cases it will convince the operator that complete destruction of hearing always follows the removal of any part of the cochlea.

These cases have been presented and examined by several members of this section.

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XXXVII.

SLOUGHING FIBROMA OF THE NASOPHARYNX.*

BY HENRY L. SWAIN, M. D.,

NEW HAVEN, CONN.

Some years ago our distinguished Fellow, Dr. E. Fletcher Ingalls, made to the association a brief statement which was of the utmost comfort and support during the many trying hours which a certain case of sloughing fibroma gave me. The hope given in the statement that I might carry my patient through years enough until he finally outgrew the tendency to recurrence, was so helpful in the dark hours of almost sure defeat, that I consider it to be my bounden duty to briefly chronicle what happened to my patient, supporting as it does what Dr. Ingalls had said. I hope hereby to doubly fortify some other much to be pitied colleague who may have resting upon him the freighting of another life to a safe and sound state of health.

Dr. Ingalls stated, as most of you will remember, that there came to him, after years of absence, a man who, when last seen, had been given up to die from the ultimate results of a recurring fibroma of the nasopharynx. All that the skill of our versatile colleague and friend could accomplish had been exhausted. Radical and conservative measures alike failed. At some certain period the growth ceased to enlarge, shrank, and finally disappeared, leaving desolate and empty the enlarged nasal chambers which it had so completely filled in the past. Other than the evident deformity of one side of the face and his dreadful experience, the young man had nothing to show of all that he had been through.

On the 28th of October, 1899, there came to me a young boy of thirteen years, whose brother I had treated for adenoids some years previously. The general idea which the mother had of the case was that her son had nothing more the matter with him than had ailed his brother, only that the obstruction

*Read at the thirty-first annual meeting of the American Laryngological Association, in Boston, May 31st to June 2nd, 1909.

which seemed to have come in his nose was worse than in the older boy. She had, however, had a dream that the present patient had been suffering from tumor in the nose, had had a dreadful operation, and had died as a result of it, and it was this spectre in the background which colored and shaped the future clinical history, as will appear in the subsequent statements. I found that the young man was suffering from a rather typical appearing, firm, round, nasopharyngeal tumor, which I took surely to be of the fibromatous type, which had its base quite typically at the upper part of the lateral wall of the nasopharynx of the right side.

Various attempts were made in the subsequent few weeks to remove the growth with a snare, but all of them failed because the young man had not then learned the amount of self-control which he later developed to a remarkable degree.

On the first of January, there seeming no other way to get around the difficulty, and mindful of the splendid work of Dr. Lincoln and Dr. Delavan with electric currents, I conceived the idea that it might be possible to shrink this mass down by ignipuncture, exactly as we are so often able to accomplish with even quite firm tonsils, and was much pleased to find that I was able to produce thereby a considerable slough.

On the 15th of the month the patient was very desirous of trying again to have the growth removed by the snare, but the attempt failed because of the bleeding which was started up, and which was quite severe and lasted an hour. It was then evident to me that, unless it was by cauterizing (ignipuncture), further attempts at removal had better be stopped, and Dr. Wm. H. Carmalt, of New Haven, who had been called in consultation in the case, felt also that perhaps the slower method would be the better one. We considered radical removal under an anesthetic, but this the family objected to.

From that time until the first of May, once every week or ten days, the portions of the tumor which presented in the nose which could be reached from in front were freely cauterized, the aim being to attack the pedicle of the tumor as much as possible with the idea that the subsequent cicatrization might, by including the nutrient vessels, cause a loss of nutrition and subsequent decrease in the size of the tumor. The patient had begun to bleed quite freely whenever the slough, which sometimes was considerable, came away from the cauterized area. Also various attempts were made from time to time to cauterize the nasopharyngeal surface by passing the

electrode up behind the palate. These were not wholly successful. So much bleeding took place later from the nasopharyngeal surface of the tumor, that he was given a powder of ferripyrin and tannin, equal parts. The insufflation of this into the nasopharynx would usually stop the bleeding.

On the 26th of May the patient began having a good deal of odor to the breath, and this was accompanied by some swelling of the tumor. On the 31st the patient bled, according to the statement of the mother, a full quart. Allowing it to be a pint, it was surely a very considerable hemorrhage. I being out of town at the time, the patient was brought on a mattress in a fainting condition to Dr. Carmalt's office. The effort and the physical exertion, or something, had so stopped the bleeding that when they got to his office, Dr. Carmalt merely swabbed the nasopharynx out with some tannic acid and antipyrin solution and sent the boy back home again.

We again talked the matter over as to whether radical operation was not advisable, and also brought in the opinion of Dr. Delavan, and supported by him, all our views concurring, we continued to wait for the electricity to accomplish what it could before resorting to such measures. No serious hemorrhage took place, and considerable slough kept forming.

Not much was done during the summer months, and the growth seemed to have ceased to enlarge. On the 7th of September, a large slough came away, and as this slough had formed after an interval of a month or six weeks, during which time nothing had been done in the cauterizing line, it occurred to me that the sloughing was really the result of natural processes rather than entirely the outcome of my own efforts at cauterizing. The slough which now came away was of a considerable size, and following its removal a half a tea-cupful of blood was lost. As a result the tumor certainly began to shrink somewhat, and we were much encouraged. One could see through below the tumor and see the posterior wall of the nasopharynx below the growth, a thing that had not happened since the start.

On the 23rd of November the tumor was again markedly swollen as though about ready to slough, and for the first time it was evident that the growth was tending to advance into the nose rather than to grow lower down into the pharynx. Again following the release of a large slough the growth contracted, and this time the upper and medium part seemed to have shrunk.

With varying fortunes, the growth on the whole apparently somewhat increased, and a very bad bleeding spell took place upon the 29th of April, 1901, as the result of the coming away of a very foul-smelling scab, and he bled in spurts for two hours. I found him practically exsanguinated, pulse hardly palpable at the wrist, and so weak that it seemed every moment as though he must pass away. A little powder up into the nasopharynx seemed to stop the bleeding, and the pulse tension was immediately raised by the dropping of an adrenalin solution, 1 to 500, under the tongue. Giving him plenty of water and using the adrenalin, we finally restored his pulse to something like a commendable volume, and he pulled through the difficulty with the tumor very much smaller than it had ever been.

Having satisfied myself that direct ignipuncture surely was insufficient, and having for the purpose installed a suitable electric controller, on November 1st, I attacked the tumor again as soon as it started to enlarge by the bipolar electrolytic method, using a Casselberry electrode. We used as strong currents as the patient could possibly bear, and applied the electrolysis as frequently as it seemed at all possible, and the result was that the patient was very little different, if any, by the first of December.

It having occurred to the mother that during both summers we had had less trouble than during the winter, we thought it might be wise to avoid the extreme cold weather, and the query was whether a milder climate might not help to keep the patient from having these dreadful sloughing times. As another sloughing period seemed imminent, as judged by the odor, at my advice they went to New Orleans and came under the care of Drs. De Roaldes and King. His description, as taken from Volume XXV of our own transactions, page 147, will indicate the condition in which the patient arrived in his care:

"The tumor was an exceedingly vascular fibroma, attached to the nasal wall with a nasal prolongation occupying and dilating the right mucosa. It had already reached the sloughing stage, and several abundant hemorrhages had weakened and exsanguinated the patient. When he first came under our observation surgical interference was not considered advisable on this account, but under the influence of our mild climate, a nourishing diet, and tonic medication, his state of health improved so much in two months that we felt justified

in attempting radical removal of the growth, and so advised the parents. The tumor had greatly increased in size, until the nasal portion reached anteriorly to within half an inch of the vestibule of the nose. In the right cheek could be seen and felt a rounded movable tumor about the size of a walnut, apparently independent in its development of the post-nasal growth. Parental consent being finally obtained for operation, I decided to attempt its removal with Doyen instruments, under cocain anesthesia."

The attempt resulted in failure, and a microscopic examination showed the growth to be a telangiectatic fibroma.

Another attempt was made under an anesthetic on the 6th of May, after the patient had recovered from the bleeding which had thoroughly exhausted and exsanguinated him, following the former attempt. Again I will quote: "Operation, May 6th. The carotids were exposed by Dr. Parnham, the right external was tied, and ligatures were passed under the common carotids on both sides to make compression, if necessary, when the tumor was being cut through. I then performed tracheotomy, transfixed the tongue with a strong ligature, tied the palate forward with a rubber catheter passed through the left nasal cavity, inserted a mouth gag, and placed the patient in the Rose position. While compression was being made on the free arterial trunks, I attacked the growth with the scissors as in the preceding operation, and by vigorous efforts cut through the fibrous mass close to the attachments and brought it out through the mouth. In spite of all our control of the arteries, the hemorrhage was almost overwhelming for the patient, and when controlled by gauze packs, saline infusion had to be practiced immediately. This was skillfully done by Dr. E. D. Martin, whose valued assistance we had also obtained. The patient responded well to the infusion, and as the bleeding into the pharynx had ceased, the tracheal wound was closed." Examination after the patient recovered from the effects of the operation showed that the septum was displaced completely over to the left side, and the right nasal cavity was enormously dilated. A small part of the base remained attached to the body of the sphenoid in the posterior part of the nasal fossa. In addition to this the tumor had spread to a broader base, including nearly half of the nasopharyngeal wall.

On the 4th of June, the patient having returned to New Haven, we were sorry to have to chronicle the fact that the

growth seemed to be returning in what might be called the middle part of the base, i. e., tending to grow into the nose rather than into the nasopharynx.

On the 17th of July the nose was partly filled up by the growth, and especially in the region of the middle fossa of the nose, it was certainly growing rapidly. The facial part of the growth was much enlarged.

The patient was then referred to Dr. Sprenger for x-ray treatment. These treatments were given to him as often as he could stand them until the 15th of November, the only effect appearing to be to make the facial and more superficial parts of the growth a little smaller, but the back part of the growth towards the nasopharynx increased rapidly in size. Then the usual sloughs began to appear, and with them the hemorrhages.

On the 4th of December the patient had an enormous, sudden hemorrhage which inside of fifteen minutes had brought him nearer to the grave than at any of the previous occasions. He was kept completely plugged behind and in front for a week, and when the plugs were finally safely removed, it was found that the facial tumor, which during the packing had swollen up considerably, went down as though a large abscess cavity had emptied itself, and both it and the internal tumor decreased enormously in size. By the time the shrinkage was over the whole mass was scarcely one-third the size which it was previous to the formation of the sloughs and the fearful hemorrhage. It was evident that the tumor on the face connected with the antrum and that the nasal wall of the antrum had atrophied by pressure, and that the whole antrum and nasal cavity were united into one irregular space. The patient also ran a temperature at this time and succeeded in getting up a middle ear infection upon that side. During the time of quiescence, which followed this tremendous change and destruction of tissue, the patient's physical condition gradually returned to somewhere nearly normal. For a month immediately following this episode he could scarcely be moved from his bed.

In the late spring, apparently with the return of the full vitality of the patient, the growth started once more to recur, and feeling that the patient ought to have the benefit of all the resources that we could command, I referred him to Dr. Delavan, of New York, to see if electrolytic treatment at his hand might not be of more benefit than it had been at my

own. During the latter part of the spring and throughout the summer Dr. Delavan, and later Dr. Harris, gave the patient electrolytic treatment to the anterior part of the tumor, and into the nasopharyngeal part injections were made of trichloracetic acid. Later the electricity was omitted altogether.

Early in September, this being the year 1903, a sloughing spell came on, during which he was taken to New York and remained at the Manhattan Eye and Ear Infirmary. The sloughs came away without any terrible hemorrhage, although he had to be plugged for twenty-four hours on one occasion owing to the severity of the bleeding.

In the third week of September he developed a severe attack of erysipelas, which nearly cost him his life. Having recovered from that, the tumor presented a smaller, hollowed-out appearance on the anterior and under surface. It still extended into the nose, so that it was almost as far front as the anterior end of the inferior turbinate, and behind extended well down toward the palate. Later on the growth gradually began to shrink away; it disappeared from the anterior and inferior portions within the nasal cavity, making its last stand in the nasopharynx.

During the next year the patient had more or less of the same treatment. He had one or two serious bleeding spells, but none of the extent and terrible force of the former experiences. He spent the two subsequent winters in Pasadena and California in that neighborhood, during which time he had only one slight sloughing spell. He developed a fistula in the external part of the face which apparently connected with the parotid gland so that he had continuous flow of at first matter and finally only clear fluid, for over two years. This is still open and in the two years just past has been kept continually packed with gauze.

The last three winters he has spent at home, and at the present writing there is nothing but scar tissue to be seen in the vault of the pharynx where the tumor masses had come and gone. His nasal cavity is filling in somewhat. There is a partial attempt at restoration of the inferior turbinate, but the middle turbinate and the nasal wall of the antrum have disappeared by pressure, as has the posterior half of the nasal septum. His chief difficulty now lies in keeping the nostril clean, because, as it often happens in atrophic rhinitis, it is difficult in a dilated nose to keep the mucus from inspissating

and giving odor to the breath and otherwise disturbing the patient. He has not had any hemorrhages to amount to anything for the last two and one-half years, and apparently, then, has fulfilled the hope that, through all his distressing history I have held up to him, that he might be another case like Dr. Ingalls'. His present age is twenty-two, so that I feel he has lived beyond the probability of recurrence and well-nigh the possibility of it.

Dr. Harris, in replying to a recent letter which inquired as to his views of this particular case,* closed his letter with a statement so admirably worded to express my own views that I reproduce it as the closing sentence of this brief chronicle of the most remarkable instance of nasopharyngeal growth which my experience has included. He said:

"Viewing it in the light of subsequent events, with a desire to give all credit to the treatment, I must confess that today I am skeptical as to the real benefit derived. It has seemed to me that the history of this remarkable case, while it was under my care, conformed entirely to the periods before and after and that we were dealing with a neoplasm which possessed the peculiar power of sloughing away and then recurring.

"It is gratifying to learn that the history here conforms to the history of other similar cases, namely, that if the patient can be kept alive for a number of years, the growth will of itself disappear. In all my reading and clinical work I have never known a case of such severity where the ultimate outcome has been so satisfactory."*

*Since writing this history early in June, the patient, while eating some ice cream in a drug store, was suddenly attacked with violent bleeding from the nose and before it could be stopped an enormous amount of blood was lost. The druggist who furnished the receptacles for receiving the blood asserts that at least two quarts were lost. The patient finally fainted and at that time the nose was plugged anteriorly and posteriorly. Some bleeding also took place from the fistula in his cheek, which was also packed tightly at that time. He was taken to a private hospital and remained there two weeks, having during that period no recurrence of the bleeding. Just previous to this hemorrhage he had been having some slight bloody oozing following the removal of inspissated mucus which had latterly bothered him more than usual. Twice during the previous month he had been obliged to pack the nostril anteriorly owing to bleeding of some amount. Whether this was all due to the fact that he had been having an attack of rheumatism and had been taking considerable doses of the salicylates is not quite clear to me, although it is quite possible. In any case, this last event adds another peculiar incident to this long struggle, coming, as it does, so soon after the writing and reading of this paper and after a period of three years of practical immunity.

XXXVIII.

REPORT OF A FATAL CASE OF STATUS LYMPH-
ATICUS OCCURRING IN A PATIENT OPERATED
ON FOR TONSILLAR HYPERTROPHY
UNDER COCAIN-ADRENALIN INFIL-
TRATION.*

By THOMAS J. HARRIS, M. D.,

NEW YORK.

I desire to report briefly a fatal case of tonsillectomy. Such accidents are, unfortunately, too frequent where a general anesthetic is employed, but so far as we can learn they are exceedingly rare where, as in the present case, only a local anesthetic was employed. The patient was a Russian Jew, aged thirty. He presented himself in my service in the Post-Graduate Hospital, complaining of repeated sore throats. Examination revealed large tonsils of the so-called submerged variety. According to the house surgeon's notes, he was admitted to the hospital at 11 a. m., April 22, 1909. His appearance was that of a short, muscular, workingman. A fluid lunch was given and at 1:15 p. m. 1/60 gr. of sulphate of strychnine was administered by the mouth. One-half hour later the patient was sent to the operating room and had a 1/5 of 1 per cent of cocain hydrochlorate in a normal saline solution containing two drachms of 1/1000 adrenalin-chlorid injected into the tonsils. The solution was freshly prepared before the operation. The tonsils were very cryptic and the contents of the first syringe containing 1 1/2 drachms entirely escaped and was expectorated. A second syringeful was injected. Of this at the outside not more than thirty minims could have been retained. There was, then, in all approximately 1/12 of a grain of cocain retained and from eight to ten minims of a 1/1000 solution of adrenalin-chlorid. After the first injection the patient complained of feeling badly, vomited and had a slight convulsive seizure, presenting the appearance that

*Read at the Thirty-first Annual Meeting of the American Laryngological Association, Boston, June 1, 1909.

we often see where cocain has been employed locally for a nasal operation. His head was lowered for a moment and he sat up again and permitted the injection of the second syringe-ful.

Anesthesia was prompt and I immediately without difficulty enucleated both tonsils with the cold wire snare. No bleeding followed. During the removal of the tonsils the patient's head was supported by an assistant. The operation could not have consumed more than two minutes. At the completion of the operation I was at once struck by the pallor of the patient and discovered that he was unconscious. He was at once placed upon the operating table with the head in the Rose position. At this time respiration was plainly visible, but I was unable to get any pulse at the wrist, although there was a peculiar fluttering or tremor at times. Morphin was administered hypodermically followed by whiskey and strychnin and oxygen and artificial respiration were employed for more than an hour before we desisted in our attempts at resuscitation.

An autopsy was performed by the coroner, assisted by Drs. Palmer and Beck of the house staff, the same afternoon. I am indebted to the latter for the following notes made at the time: Nothing abnormal was discovered in the lungs. When, however, the pericardium was opened it was found that the right auricle was swollen. The right auricular appendage was dilated with fluid blood until it was five times as large as the left. The right ventricle was also swollen, but not so much as the right auricle. The auricle showed a peculiar power of contractility, a wave of contraction passing over the entire auricle and sometimes returning when the auricle was stimulated by a blow of the instrument. The muscle wall of both sides of the heart looked normal. The left side of the heart was rather undersize in proportion to the size of the man. The valves were all normal except the tricuspid, which must have been opened due to the dilation of the right side. The thymus gland weighed eighteen grammes and was bunched up in the top of the sternum. The distance from the sternum to the body of the vertebrae was one inch. The trachea and bronchii contained a little blood and mucus. The stomach contained dark-colored mucus. The glands of the axilla and groin were slightly enlarged. The kidneys were normal.

The pathologist of the hospital, Dr. H. T. Brooks, exam-

ined the thymus gland and reported that the most striking feature was that it showed no atrophy, which in a person of this age is to be regarded as abnormal. The patient died in all probability, of an overdilated right ventricle, due to the enlarged thymus with its action on the trachea and recurring laryngeal, with the cocain-adrenalin injection acting as exciting cause.

During the last few years a great deal of interest has been taken in the subject of the thymus gland, and recently a symposium was held in the New York Academy of Medicine on status lymphaticus. One of the most complete articles on the subject is to be found in "Osler's System of Medicine," by Aldred Scott Warthin, Ph. D., M. D., from which I take the liberty of quoting at some length.

"Atrophy of the lymphoid tissue with its replacement by adipose and fibrous connective tissue takes place gradually from the second year to the advent of puberty and more rapidly after this time, so that in the adult the thymus comes to be replaced by a mass of fibrous tissue and fat containing small nodes of lymphoid tissue.

"Numerous cases occurring in the literature of the last several years have proved beyond all doubt that such a compression of the trachea does occur as the result of thymic enlargement, even when the increase in size does not far surpass the limits ordinarily regarded as normal.

"All thymic enlargement may be regarded as relative or absolute. The weight in different individuals varies greatly. In general it may be said that any thymus weighing fifteen grammes or more is hyperplastic. Increase in the thickness is of far greater importance than an increase in any of the other dimensions.

"Thymic enlargement occurs as apparently an independent condition or in association with the status lymphaticus, tonsillar hyperplasia, adenoids, etc.

"In thymic death all symptoms point to suffocation resulting from tracheal stenosis and secondary laryngeal spasm as the chief, if not the only, cause of the fatal termination. To a reflex spasm of the glottis may be added a reflex cardiac paralysis, or the latter may alone be the direct cause of death in those cases of sudden death in which all signs of tracheal compression or laryngeal stenosis are wanting.

"The compression of the great vessels lying beneath the thymus may cause disturbance of blood pressure, cardiac dila-

tation. We must, therefore, conclude that the immediate cause of death varies in thymic enlargement, but the general picture is that of a convulsive attack of thymic asthma of the severest type. The muscular spasm closes, the face becomes ashy, then intensely cyanotic, reflex irritability is lost, there is rapid cardiac failure and death suddenly ensues. The reported cases of thymic death tend to show that its occurrence is often apparently induced by a number of factors that have no effect on the normal individual. Sudden death from fright or intense emotional excitement during trivial surgical operations has in too many instances been associated with enlarged thymus. It is probable that a large proportion of deaths occurring in surgical anesthesia are due to this condition. An enlarged thymus has been found in many of the sudden deaths associated with slight operations, such as the removal of teeth or adenoids and tonsils."

The foregoing conforms very largely to the conditions in our case. The patient had an enlarged thymus, eighteen grammes, which while not excessive is sufficient to account for all the symptoms produced. There was the convulsion with pallor followed by the intense cyanosis. There was, however, no tracheal stenosis, and the death, as shown by the autopsy, was undoubtedly of cardiac origin. How important a role the local anesthesia played it is difficult to say. From what authorities on the subject say, the slightest agency, as fright or excitement, is sufficient to serve as an exciting cause. We cannot conceive that the small quantity of cocain, 1/12 of 1 per cent, freshly prepared, to have contributed largely to the fatal result. Whether the amount of adrenalin (eight to ten minims of 1/1000 solution), with the possibility of more having been absorbed through the stomach from the first syringeful (although it is our firm belief that this was all expectorated), can be considered a more weighty factor, is open to question. While it has been employed very largely in this form, we recognize that a number of warnings have been given regarding the possibility of accident, especially where there was a diseased condition of the heart or blood vessels, which in our case was not present. We have not had an opportunity to thoroughly examine the literature, but in a hasty survey we have not been able to discover any reported case of death from cocain-adrenalin infiltration. We have heard, however, of one such case occurring in Baltimore within the last few months, where a Schleich solution was

introduced for the removal of the tonsils. Here, we were informed, the patient died three hours after the operation. Two cases have recently occurred in New York City, one where a strong solution of cocain-adrenalin was introduced into the nose on cotton in a young healthy adult, and the other where a strong solution was painted over the tonsils of a boy for tonsillectomy.

XXXIX.

NERVE DISTRIBUTION IN RELATION TO NERVE
REFLEXES SIMULATING LOCAL
INFLAMMATION.*

By ARTHUR AMES BLISS, M. D.,

PHILADELPHIA.

The development of painful sensations within the upper respiratory tract and ear, as well as through the head, at points more or less distant from the site of an inflammation, produces a class of patients in whom diagnosis and treatment present many elements of uncertainty and doubt. Over this wide area, "reflex" irritation depends largely upon the distribution and intercommunications of the fifth and eighth pairs of cranial nerves, the trifacial, pneumogastric, glosso-pharyngeal, and spinal accessory. There results a complicated network of sensory, motor, and sympathetic fibres, each one a possible track for short circuiting or deflecting nerve impulses, by each fibre, in terms of its own function, to areas remote from the causative lesion. And the mere "reflex," alone, is rendered, in many instances, more complicated by the intensity of the suffering produced and the need for relatively prompt relief. The trifacial nerve, perhaps the chief offender, has four ganglia which form the whole of the cephalic portion of the sympathetic system. Its first and second divisions are sensory nerves, the ophthalmic and superior maxillary, with the ophthalmic and sphenopalatine ganglia. The third division, inferior maxillary, connects with the otic and submaxillary ganglia. The interlacing of fibres between these three divisions and the ganglia is direct, and their communication, also, with the sympathetic plexus of the cavernous sinus and with the carotid plexus. Emerging from the distal source of this great nerve, the Gasserian ganglion, fibres go to the tentorium cerebelli and the dura of the middle cranial fossa. Its ophthalmic and superior maxillary divisions

* Read at the meeting of the American Laryngological Association, held in Boston, May 31-June 2, 1909.

are closely associated with fibres which bring the sphenopalatine ganglion and nasal nerve, and naso-palatine nerve, in intimate relation, by means of the ciliary nerve, with the iris and ciliary muscles. The trifacial is the great sensory nerve of the cranium and face. By its ophthalmic division, it gives sensation—and pain, as well—to the frontal sinus region, forehead, and the scalp as far back as the occiput. The course of its three main branches lies between the ocular muscles, and they supply the corrugator supercilii occipito-frontalis, and orbicularis palpebrarum muscles with common sensation—too frequently, with uncommon sensation. The ophthalmic's nasal branch, the nasal nerve, is distributed over the very area, on the side of the nose and inner angle of the orbit, exterior to the anterior ethmoidal cells, supplying, also, the conjunctiva, lachrymal sac, and caruncle lachrymalis. The superior maxillary connects its anterior dental nerve with its Meckel's ganglion. This ganglion, itself, sends that most sensitive nerve of the nasal chambers, the naso-palatine, or nerve of Cotunnus, out below the opening of the sphenoidal sinus, and across the nasal septum within constant reach of the pressure of a swollen middle turbinated body. The posterior branches of this Meckel's root of many nasal evils, this sphenopalatine ganglion, are the vidian and the pterygo-palatine nerves, connecting it with the nasopharyngeal region and the carotid plexus of the sympathetic. Over this track pass the reflexes that produce asthmatic attacks of purely nasal origin. To make matters worse and more confusing, as stated before, Meckel's ganglion is in relation with the ophthalmic ganglion. The inferior maxillary branch of this troublesome fifth nerve is a nerve of three functions, sensory, motor, and special sense for the tongue. Its otic ganglion brings it in close relation with the external auditory meatus and canal, by the auriculotemporal nerve, and, with the chorda tympani, by fibres from the gustatory or lingual nerve, as well as from the submaxillary ganglion. At several critical points this trifacial nerve is in relation, by communicating fibres, with the facial nerve.

In a state of health it is, doubtless, proper to regard the trifacial nerve with considerable admiration, for its purpose to control so many and varied activities, but, when coryza develops and the special poisons of grip establish their cycle of symptoms, this remarkable nerve can become the originator of much suffering for the patient and perplexity for the physician.

I think that we are too apt to regard the very complex tangle of anatomy constituting the nasal chambers, as a simple architectural structure of bony boxes, rather apart from the functional activities that are inherent in all vital tissue. We look at them from the standpoint of a mechanic, and develop the habit of regarding morbid activities within them, as prone to follow the very definite course of inflammation, hypersecretion, and suppuration. So, when pain develops within the region which they control, we tend to the belief that this pain is due always to the existence of pressure by occlusion or retained secretions. So resort must be had to methods of carpentry and plumbing. It is well to remember that a neuritis or a neuralgia of the fifth nerve, and of its separate branches and ganglia, can occur, as with any nerve, and may occur from any of the causes that produce neuroses elsewhere, from auto-intoxication, or from direct inflammation, as in the complex of symptoms which we call grip. With the onset of rhinitis, there develops, at once, a vicious circle; for irritation of sensory fibres of the ophthalmic and superior maxillary react on the sympathetic plexuses, and we have vasomotor irregularities, which, in themselves, increase the irritability of the sensory nerves. The fifth nerve now rises to the occasion, and the whole area of its distribution may be involved in a general mass of misery. The streaming eyes avoid the light, and movements of the ocular muscles are painful. The head aches from the face to the back of the neck, and the teeth are sensitive. The ears are sore and aching, and the tensor of the drumhead and the stapedius muscle vibrate in quivering, spasmodic movement. The frontal sinus region is excessively tender to the touch; so, also, is the area over the anterior ethmoid cells. There may be a contraction of the orbicularis muscle, forming a thickened body over the eyebrow, which we may fancy to be true swelling over the frontal sinus. Of course, these areas are painful under even light pressure, and the bony box idea of the nasal chambers favors the happy thought that the frontal sinus is full of pus; so, too, the ethmoid sinuses; "anyhow, something must be stopped up, inside, that ought to come out!" Now, for drills, chisels and rongeurs!

Well, in the majority of attacks of an acute rhinitis, there is no pus in these sinuses. It is doubtful if any exudate exists there. I am convinced that, more often than not, the mucous lining is not even swollen. The pain is a neuralgia or

neuritis of the wretched fifth nerve. The best results will come from the simplest and most gentle treatment of the nasal chambers, and full attention to the patient's general condition, of which the nasal discomfort is merely a local expression. Then, too, in this class of cases, it is not so very difficult to cause a real infection of the sinuses by overanxiety to probe into them. Once infected, of course, you have a surgical state of things, and some aggressive minds would be delighted with a certainty, now, for the need of carpentry and plumbing. I believe that a safe guide for the real need of surgical interference is found, as in acute mastoiditis, in the temperature range, the duration and continuance of real pressure symptoms, and in the mental state of the patient. We cannot ignore the fact that the ophthalmic vein and cavernous sinus are related closely to the frontal sinus regions. The lymph vessels, also, may be carriers of infection to the meninges. In cases, even, of true sinusitis, we have, also, the elements of a neuritis of the associated nerve tracts. The wise physician must consider the data at his command, and, while not deceived by a nerve irritation, which, in most instances, is the gist of the situation, be on the alert for manifestations of what may be a grave condition within the nasal sinuses, demanding surgical treatment. When an acute influenza complicates a case of chronic sinusitis of any one or more of the nasal sinuses, there is less reason for giving too much weight to the question of nerve irritability, alone, in a desire to avoid surgical procedures. But, in these cases, the clinical conditions are apt to be presented with a frankness that leaves little doubt as to the requirements for relief.

In purely acute cases, aggressive surgery is almost never needed. In chronic cases with acute infection added, the necessity for it is not infrequent. In chronic cases, alone, free from any acute exacerbation or infection, the question of operative treatment must be decided by the judgment of the physician, based upon a study of the conditions presented by each patient, alone. No one can state bluntly that, as a rule, every chronic case of nasal sinusitis must be attacked by gouge, chisel, and curette, or that, on the other hand, it must be treated only by irrigation and antiphlogistics.

The glosso-pharyngeal branch of the eighth cranial nerve, by its tympanic branch, Jacobson's nerve, from the petrous ganglion, is distributed to the fenestra ovalis and fenestra ro-

tunda. It has communicating branches to the greater and lesser petrosal nerves, and, by the latter, to the otic ganglion. I saw a lady, on one occasion, who had been distressed for many months by a peculiar cough. After a long course of fresh air and forced feeding treatment, she had been urged to try the climate of Southern California. No one had examined this patient's ears. Her cough was peculiar, and was of a character that always should excite suspicion of a "reflex." It was "dry," hacking, ineffective, at times paroxysmal, and with gagging. One could say, too, that this patient had laryngitis, for the vocal cords were pinkish, and the mucosa of the larynx reddened, from the irritation of coughing. This patient's ears were filled with impacted cerumen over a bed of hard, desquamated epithelium. The hearing was not affected to an extent that was noticeable. The very simple matter of clearing the external auditory canals ended the patient's long term of hacking cough, forced feeding, and medication. The "reflex" irritation had gone over the track of the otic ganglion, inferior maxillary, glosso-pharyngeal, and pneumogastric nerves to the pharynx, larynx, and trachea.

The existence of aural pain, simulating that of an acute otitis media, coincident with dental caries, eruption of the teeth, and irritation of the dental nerves, is so well recognized as to need merely a passing notice. Less frequently noted is the persistence of discomfort, and even pain, over the mastoid region and back of auricle, which has led to the trephining of the mastoid cells, in the belief that the cause might be intracellular inflammation. The auricular branch of the pneumogastric, Arnold's nerve, joined by filaments from the glossopharyngeal, reaches the surface between the mastoid process and the external auditory meatus. This distribution is well to remember in cases of vague mastoid aching, where all evidences of mastoiditis are wanting. A case occurred in my practice, during the epidemic of grip this winter, where the patient, a man of middle age, suffered intense pain within the ear, over the corresponding mastoid process, down the neck, and over the temporal region of the same side. He had a persistent temperature, well above normal, lasting many days. The drumhead was quite red, but without distension, reddened by the instillation of drugs to relieve the pain. Hearing was normal. The pain was spasmodic, and was not developed by pressure on the mastoid process. It was a case suggestive of a possible otitis media, with mastoid involvement, but the

cycle of symptoms overreached itself in its efforts to deceive. The distribution of the painful areas, the character of the pain, itself, all pointed to a neuralgia, and yielded to salicylates and aspirin. Reference has been made to aural cough; but we have, also, a reflex cough that is distinctly "nasal." In some individuals any irritation along the course of the naso-palatine nerve, but, especially, opposite the posterior half of the middle tubinated body, will develop this "reflex." It may become a very annoying feature of attacks of rhinitis, paroxysmal in type, of vasomotor instability; or, it may be caused from pressure from structural defects in the nasal chambers. Such coughing is not laryngeal or tracheal. It is nasal in origin, and will not yield to sedative medication.

The glosso-pharyngeal nerve, by its pharyngeal branches, uniting with filaments of the pneumogastric, goes to the pharyngeal plexus, uniting there with the external laryngeal and sympathetic nerves. It has a branch to the tonsils, going, also, to the soft palate, anastomosing with the palatine nerves. Elongated uvulae that flap about the fauces, sticking to the pharyngeal walls or to the tonsils, can thus produce coughing, quite as well as by tickling the larynx. Inflammation of the tonsils, especially enlargements of these masses, with retention of caseous substance, hyperplasia in the form of fibrous bands binding down such swollen tonsils, can all be productive of "reflex" coughing, which might lead a careless observer to suspect laryngitis, tracheitis or bronchial catarrh. For many chests will give suggestions of abnormalities in percussion and auscultation that are not due to lesions, but, rather, to structural idiosyncrasies. Taken in connection with a purely "reflex" cough, they can suggest to the examiner's mind a causative element, although harmless in themselves, thus producing uncertainty and errors in diagnosis.

The sensory nerve of the interior of the larynx, including the vocal cords, is the pneumogastric's superior laryngeal nerve. Its course, along the side of the pharynx, behind the internal carotid artery, brings it into association with the deep chain of cervical lymphatic glands, and pressure from an enlarged gland, even without the added element of suppuration or caseation, may induce "reflex" coughing. A child, eleven years of age, having enlarged glands in the left side of the neck, was annoyed by a persistent and very distressing cough, most noticeable at night. The patient had hypertrophied faucial and pharyngeal tonsils, but was free from any other le-

sions. I excised the tonsils and adenoids, thus obtaining relief from mouth-breathing. The cough continued, however, until the cervical lymphatic glands were completely removed by a very thorough dissection of the neck. As the superior laryngeal nerve and the pharyngeal branches of the pneumogastric are associated closely, a simple condition as hypertrophy of the mucous follicles in the pharynx, especially in the lateral chain, behind the posterior faucial pillars, can excite a reflex in the form of a so-called laryngeal cough.

Pressure on the recurrent laryngeal nerve is more apt to be attended with changes in the patient's voice, or interference with respiration, rather than with reflex coughing. I note, in passing, the well-known fact that an aneurism at the aortic arch, or in the right subclavian artery, is revealed, very often for the first time, by the picture of a laryngeal paralysis reflected in the laryngeal mirror, and this is the case, also, where tumors exist in the mediastinum. Equally well known, in these days, is the development of right-sided laryngeal paralysis from an infiltration at the right pulmonary apex, within the pleura or overlying lymphatic glands. But the relation of laryngeal lesions with affections of this motor nerve of the vocal cords is too well developed in medical literature to justify a further discussion of this subject. This mere sketch in outline of the distribution of the fifth and eighth pairs of cranial nerves may explain a puzzling class of patients, whose subjective symptoms are intensely distressing, and yet whose recovery is rapid, under internal medication or very sedative local treatment. It may indicate, also, the need for care to avoid unnecessary surgical interference in this class of cases, especially in subjects where the pro and con are uncertain as to the need for opening into any one or more of the nasal accessory sinuses. Exact diagnosis is of great importance in these cases, where it is often most difficult to make. The X-ray and transillumination are, indeed, most helpful, but are far from being infallible guides. With all our modern mechanical aids, we must still depend, very largely, on personal and direct observation, aided by clinical experience. Errors in these cases are made easily. Aggressive operators may be led astray by their surgical zeal and the apparent, although not real, need for its exercise. Thus, much unnecessary suffering may be inflicted by an undue surgical interference, the evil results of which, it is true, may not be revealed to anyone, unless to the conscience of the operator.

XL.

TAKING COLD.*

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The expression "taking cold," as so frequently used by patients, and sometimes by medical practitioners, is in so many cases a misnomer, that I have purposely used the term to call attention to this particular fact. The practitioner of special medicine so often sees the individual with a condition resembling a cold in which there is no history of exposure nor usual systemic phenomena, and yet, to all intents and purposes, the patient is suffering from a cold in the head, or has taken cold.

Let us first, then, divide the condition of taking cold into three classes: First, actual cold; taking cold; acute rhinitis. Second, an underlying systemic condition which produces some local manifestation and irritation in the mucous membrane, predisposing the individual to taking cold. Third, an underlying systemic condition in which the patient has not taken any cold, but the symptoms produced in the mucous membrane are those of a cold.

The first condition is a separate and distinct process, a simple acute rhinitis. The second is a compound process, a systemic condition and a local process. Just what particular function is wrong is to be determined by the practitioner, but the systemic condition predisposes the individual to cold; in other words, it lessens the vitality of the mucous membrane and lowers its resistance. And in the third condition—let it be neuroses, let it be a circulatory, a vasomotor, or chemic, or an organic, or systemic lesion which is locally manifested in the mucous membrane of the upper respiratory tract—the irritation thus produced in this local manifestation produces a lesion identical with that of having taken cold. In other words, a patient may have every symptom of cold in the head,

* Paper read before the Southern Section of the American Laryngological, Rhinological and Otological Society, Richmond, Va., February 12, 1909.

and yet have not been exposed; in fact, it is likely that he may have been seated before the fire in a comfortable, well ventilated room, free from draughts or exposure.

It is with the second and third classification that this paper deals, although the subject is that of taking cold. The first classification of simple cold, we will omit, and deal entirely with the second and third classifications, as given above.

Taking cold, then, implies more than a local condition. It may be dependent on constitutional conditions, either original or acquired. Certain individuals, under varied conditions, are more susceptible to cold at one time than another. At certain times a person may be exposed and not take cold, yet at another time, without any apparent rhyme or reason, he takes cold. This cannot be explained on any other basis than an individual systemic or constitutional condition.

The lithemic condition, where the patient without any exposure whatever may suddenly develop a severe cold, is also classed under the ordinary term of "cold." This, however, is due to the faulty chemistry of the secretion, where the glands of the mucous membrane, in pouring out their normal secretion (this secretion having been perverted), produce an irritating mucus, which in turn inflames and irritates the nasal mucous membrane, causing every symptom of a severe cold in the head. Individuals with rheumatic, gouty, or lithemic diathesis are especially predisposed. Such individuals, with necessarily sensitive mucous membranes, would certainly have the so-called chronic cough.

Contagious and infectious diseases also render the mucous membrane sensitive and predispose the individual. This is illustrated by the catarrhal conditions following all the infectious diseases of childhood, and, in fact, all infectious fevers. Frequently, following the recovery from the original lesion, the patient is for several winters very susceptible to cold, and usually has a slight, hacking cough.

Digestive disturbances, torpid liver, constipation, faulty elimination due to a lesion of the genito-urinary tract, may be a systemic underlying etiologic factor.

Fatigue, either physical or nervous, renders the individual very susceptible, and, while this should be classed under constitutional conditions, yet the individual's general health may be good, but at the time of exposure his physical or mental exhaustion renders him more liable to take cold.

Nasal irregularities and obstruction, rendering the mucous membrane sensitive, are also predisposing factors.

Persons with sensitive skin or sensitive areas are also very susceptible. Interference with the function of the skin, which may be due to chilling of the surface when a person is warm or overheated, may predispose the individual to taking cold. When a portion of the body, especially the back of the neck or head, or the extremities, is exposed to draughts, the person is very likely to take cold.

Sudden changes of temperature and climatic conditions may act as local and systemic predisposing factors; also sudden changes of temperature, from a hot to a cold room, or the reverse, are equally predisposing factors.

Over-ventilated or poorly ventilated rooms, especially in school buildings, where the individual is exposed to a draught by poor ventilation, may predispose to cold. Individuals living and especially sleeping in rooms heated by means of registers, in which there comes from the furnace dry heat charged with dust and irritating gases, owing to the irritating effect on the nasal mucous membrane, are rendered more susceptible to cold.

Certain seasons render individuals more susceptible to taking cold than others. The spring of the year, when the individual is likely to change from heavy clothing to a lighter weight garment, is a decided predisposing factor. In certain sensitive individuals, the exposure of the ankles or wrists to draughts predispose that individual to taking cold; yet, after all, many of these so-called predispositions or sensitiveness on the part of the individual are due to a systemic condition which renders him susceptible to taking cold.

Occupation may predispose an individual to taking cold. The mucous membrane of the upper respiratory tract, owing to the constant irritation from extraneous material, is in a constantly susceptible condition. Colds and cough follow, and the individual is constantly exposed to a serious infection.

Irritating vapors may cause the mucous membrane to become sensitive and render the individual much more susceptible. Dust and smoke may also be classed as predisposing factors.

The automobile is an exciting factor. Individuals exposed to dust and facing strong wind suffer with faceache, conjunctival irritation, and nasal congestion; this continued conges-

tion blocks up the accessory cavities and tends to congestion of the nasal mucous membrane, lessening its resisting powers and interfering with normal functions, thus predisposing the individual to taking cold. The same condition has been observed in railroad engineers and individuals who test the speed and vibration of engines.

In many of the above mentioned predisposing causes the process known as "taking cold" may be arrested in the early stages, if the cause can be removed before the congestion passes into the second stage of the inflammatory process, saving the patient from the cough necessary to the resolution stages.

In the various forms of rheumatism and gout is frequently observed the irritation of the mucous membrane of the upper respiratory tract, especially the nasopharynx and larynx. The same is true of the lithemic individual with the excessive alkaline or the excessive acid secretion, or a neutral secretion containing irritants.

The nasal congestion of puberty, due to hyperemia, or the nasal congestion of middle or old age, or the menopause period, in which the congestion is a cyanotic or sluggish one, all give rise to a condition similar to a cold in the head.

Nervous excitement, shock, nervous tension, constant worry, through their effect on the nervous system and general perversion of the secretion, will cause constant irritation of the mucous membrane and give rise to symptoms identical with those of a cold in the head.

The irritating effect of the nasal and nasopharyngeal secretions on the mucous membrane, as an exciting factor, can be clearly demonstrated by changing the chemistry or the reaction of the secretions, by internal medication, and you will find that the cold in the head will clear up as suddenly as it came, showing that it was nothing more than a local manifestation of a systemic condition — a faulty chemistry — the secretion either coming to the surface as an irritant, or, when coming to the surface, undergoing chemical changes, producing an irritant.

It is a well-known fact that in certain individuals the actinic rays produce congestion of the nasal mucous membrane and also the conjunctiva. Some individuals, when exposed to the actinic rays, especially when associated with the glare from water, will develop in a few minutes an irritated condition of

the mucous membrane almost identical with a sudden and acute cold, or probably more resembling the condition known as hay fever. All the forms of hay fever, rose cold, horse fever, rye fever, ragweed fever, and similar conditions, no matter by what name known, are in many if not all cases due to the irritating effect of the secretion, either direct or in combination with some extraneous material, but the symptoms produced are very much the same as the ordinary cold in the head.

Frequently children suffer from so-called cold in the head, often due to exposure and carelessness. There is a tendency on the part of some practitioners, parents and nurses, to do what they please to term "hardening the child," by cold baths. In many instances this is fatal. Certain individuals do not react from the cold bath, while in others it is an excellent tonic to the circulation and may serve to prevent the individual from taking cold. It is purely a personal equation, and it is simply folly to endeavor to harden the child who is suffering from some systemic condition which irritates his mucous membrane, by the cold bath process. I have several cases in mind in which this cold bath was insisted upon, and, to be sure, the child now does not take any cold, but is quietly resting out in Cedar Hill (Cedar Hill being one of our largest cemeteries).

It narrows the matter down to a question of personal or individual equation, and the individual and personal study of every case as to why the child or individual takes cold, as to what form and course this so-called cold pursues, and why on one occasion without exposure he takes cold, and on another occasion after being exposed he does not take cold.

Nasal congestion, causing mouth breathing and continual symptoms of cold in the head, as observed in boys and girls at the age of puberty, we all know is due to a physiological process. It is in reality a physiological hyperemia of the erectile tissue. Why, then, sacrifice this membrane? Why cauterize, cut or burn this perfectly normal tissue? Local treatment does practically no good, but in the course of a few months, or when the individual has passed through the age of puberty, you will find that this tendency to take cold in the head, or the chronic condition of cold in the head, has disappeared, and instead of having a scarred and irritated mucous membrane you now have a perfectly normal and healthy tissue.

The same is true in regard to local treatment and surgical interference in a vast majority of conditions as described in

this paper. To be sure, sometimes sedative local treatment may give a certain degree of comfort to the patient, and the nasal congestion may be so marked as to threaten involvement of the Eustachian tube and middle ear, or of some of the accessory cavities. Then and only in such cases where the threatened danger would be greater than the loss of a certain portion of the tissue, should operative interference be offered. In many instances where the local condition is really a local manifestation of a systemic condition, solutions and treatments applied locally only aggravate the already irritated tissue, and the treatment should be directed medically toward the removal of the underlying cause; in other words, the application of the old surgical teaching, "Remove the cause."

Reviewing, then, these systemic conditions which bring about irritation of the mucous membrane which resembles taking cold, it certainly shows that in a large percentage of cases of so-called cold in the head, no one remedy could be applied, and that the individual must be studied as carefully for the predisposing cause or underlying element as though typhoid fever or a beginning pneumonia were suspected. In other words, every individual case should be studied from an individual standpoint. The individual study of cases enables the physician to scientifically apply his remedial agent and not empirically prescribe a cold remedy. My own experience has been that out of one hundred persons presenting themselves for relief of what they call a cold in the head, or having taken cold, or frequently taking cold, at least eighty per cent belong to the class of the systemic condition, either constitutional, organic, or chemic.

XLI.

LARYNGEAL PARALYSIS AS EARLY INDICATION OF SYSTEMIC DISEASE.

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Virchow is quoted as saying that "no medical specialty can flourish which separates itself completely from the general body of medical science; no specialty can develop usefully and beneficially if it does not remain in relationship with other specialties and drink ever and again from the fount of general medical knowledge, thereby preserving for science, even if it should not be necessary for practice, that unity upon which the position of specialism rests intrinsically."

Our knowledge of the intimate relationship of ear, throat and nose diseases to internal medicine has been greatly advanced in the past twenty years, but there are many inexact conditions constantly facing us in this specialty, proving that the field of this relationship has as yet been only superficially explored, and I venture to predict that during the next decade morbid states in the region of human anatomy which we specially cultivate and their correlated symptoms to general medicine will be surprisingly extended, because of further discoveries in pathologic research.

The nervous system being almost entirely inaccessible to direct observation, with trifling exceptions, the state of this system can be ascertained only by the manner in which its work is done; and morbidity reveals its presence here in some cases only by derangement of the normal physiologic function. This disordered function being our only guide to diagnosis of certain affections in the larynx, the necessity for close study and early recognition of any divergence from the normal is self-evident, especially when such divergence is possible without any manifestation of subjective signs.

Although many diseases of the larynx exist which are strictly limited to that organ and are essentially local, yet a larger and more important number of laryngeal affections for which the aid of the specialist is sought, is only part and

parcel of systemic disease for which constitutional treatment is mainly required. Local lesions may exist where the trained hand of the special surgeon is called for, but to that extent only his art is called upon in many diseases of the general system. Again, cases occur in which without any anatomical change existing in the larynx very unpleasant sensations and painful states are found in that organ, all of which are relieved by systemic treatment alone, such as general anemia, periodical disturbances of the circulation, general plethora, nervous excitability, gout, rheumatism, etc. These ailments are now fairly well understood, but what is not so well known is the *raison d'être* of those actual organic lesions, as well as disordered functions occurring in this organ which are indicative and symptomatic of grave general disease and are forerunners of it.

The elucidation of these laryngeal symptoms is difficult as well as interesting, because many intricate questions in neurology, both physiologic and pathologic, present themselves and take the laryngologist often beyond the sphere of his specialty.

Discussion of general laryngeal paralysis opens up too large a subject for this short paper. I would only, therefore, venture to briefly call your attention to the earliest recognizable parietic state of the cords or of one cord, as being of practical value in establishing diagnosis; for if the paralysis be unilateral it may in no way proclaim its existence subjectively, and must be sought for if one does not wish to miss the opportunity of making early diagnosis. While cord inaction may be due to local conditions, it may, on the other hand, indicate future trouble, and be simply a silent storm signal of the coming grave event. A patient may present himself with complaints which have not apparently any direct bearing on laryngeal disease, but by following a routine practice of making thorough examinations we sometimes are rewarded by lighting upon a unilateral posticus paralysis unexpectedly. No perceptible change being evident in our patient's vocalization, he assures us there is nothing wrong with his throat, and the ordinary laryngeal functions being unembarrassed his statement seems reasonable. When we have found it we cannot say, however, that the faulty state of one cord is pathognomonic of any approaching particular disease, since it may arise from some trivial local lesion or surface irritation. For instance, an enlarged lymph gland

may by pressure cause a paretic cord lasting for years, thus a guarded prognosis is called for where a graver lesion is not discoverable. In no other organ of the body is disease so dependent on the general condition of the system as the larynx, and conversely the finding of certain signs in the larynx throws light on latent or obscure processes in the entire system. The recognition, therefore, of the earliest indications of trouble cannot be overestimated.

That state of unilateral abductor paralysis wherein we notice the fixation of a cord in the so-called cadaveric position, causing a cracked, raucous voice to a degree which gives discomfort to the patient and he realizes that something is wrong; as well as that state of partial laryngeal stridor, which sometimes ushers in unilateral abductor paralysis, was most ably delineated to the profession in May, 1908, at Montreal, by Gleitsmann, Casselberry and Delavan, and little reference will now be made to these conditions in this connection. In such cases of tangible laryngeal symptoms which are both subjective and objective, the laryngologist turns at once, or at least should do so, to the vital phase of the question and searches for constitutional disturbances, which when found reveal the pathologic cause or causes of the trouble. But of a more problematic character is the question of primary simple posticus paralysis, wherein one cord is fixed in the median line with the free border taut and with phonation remaining normal. The median posticus position is caused by the early failure of the abductors (Friedrich), thus illustrating Semon's law, that the abductors are the most vulnerable in the event of any arising morbidity. The first step in the further progress of this posticus paralysis is relaxation of the taut border, which then becomes concave towards the median line and bows outwards, going on to complete recurrent paralysis.

Regarding the three cases that I noted where the early phenomenon of abductor paralysis occurred, I am compelled, unfortunately, to speak from memory alone as regards two of them, which, of course, militates against my observations, since they are now unsupported by clinical data which I formerly possessed. This loss was due to the confusion incident to our moving into a new hospital building over a year ago. The old records after removal were found to be so chaotic and disarranged that reference to them was not feasible.

CASE 1.—A. B., aged 50, a laborer, was treated at the West-

ern Hospital for chronic nasopharyngitis and unilateral abductor paralysis for six months. His voice was natural during this time and no peripheral irritation existed beyond a catarrhal state of the laryngeal mucosa. His mode of life was very precarious and when opportunity offered he stimulated freely. No personal history of luetic infection; his family history was unreliable, which indeed, might be said of his entire statement. After six months' irregular attendance at the clinic he developed pronounced symptoms of *tabes dorsalis*. The patient later left the city and was lost sight of.

CASE 2.—J. B., male, aged 40, in fair general health, claimed to have drank enough beer to float an ocean steamship, attended the clinic complaining of dry throat (perhaps because he had not had his usual daily allowance of moisture). Only symptom present, unilateral abductor paralysis. No sensory signs referable to this organ. His attendance at the out-door clinic was very irregular, but my recollection is that on and off, for the greater part of a year, he appeared occasionally, when signs of *tabes dorsalis* arose and I was pleased to send him to another clinic.

CASE 3.—J. G., aged 37, came to the hospital complaining of nasal stenosis. Examination of his larynx showed unilateral abductor palsy without subjective laryngeal symptoms. In three weeks bilateral paralysis ensued and he entered hospital for treatment. During his two weeks in hospital his inspiratory stridor was such as to necessitate constant preparation for tracheotomy, but in that time the cords relaxed and breathing became easier. In four months later typical ataxic symptoms were in evidence. In this case I have the exact data, having lectured on it and exhibited the patient to students at the clinic 12 years ago, I retained an extract of the lecture. On reviewing this lecture I notice that many facts then referred to as bearing on laryngeal paralysis were quoted in the symposium upon this subject at the Annual Meeting of the American Laryngological Association in May, 1908, which goes to support Dr. Delavan's statement on that occasion, viz.,—"of late years not much has been advanced on this subject and that little has not been illuminating." If, however, we take the comparison a little further back, the discoveries and advances due to pathology and bacteriology have been very distinctly illuminating.

Thus far I have referred only to those cases of paralysis in which there is no accompanying peripheral inflammation

locally, or at most only a small area of such around the arytenoids and not a general laryngitis, but in estimating the value or significance of cord palsy, unilateral or otherwise, we have to bear in mind other possible causes of this phenomenon, where both objective and sensory signs are very pronounced. Rosenberg (Berlin) gives a record of three cases which he found very anomalous, and although due apparently to peripheral conditions they failed to yield to suitable extended treatment and hence the suspicion of latent constitutional disease was unavoidable. These cases lasted three months, eight months and thirty-two months respectively, and the last one had not entirely recovered when he made the report. They were all cases of unilateral cord paralysis in conditions of acute and chronic laryngitis, which is different from the ordinary experience of laryngologists, for in such cases the paralysis is commonly bilateral from the general surface inflammation. These cases were well worthy of study from their stubborn nature in yielding to the treatment of a specialist of high standing, and where the patients had the great advantage of good social status, and all that pertains to it, in change of climate, sea voyage, etc. In such unusual cases where the cure was unaccountably protracted the natural tendency would be to think of tubercle, syphilis or cancer, but all these people eventually recovered normal cord functions. Should similar cases as these occur in the out-door clinic of any hospital, where the individual was deprived of the social advantages mentioned, the treatment would have been still more protracted, in all probability. Indeed, the case would be remarkable for possessing sufficient faith in any physician, who in a fractional part of the time stated did not by his remedial measures demonstrate the practical advantage of continuing under his care.

CONCLUSIONS.

The brevity of this paper necessarily excludes many other pathologic causes of early laryngeal palsy, such as bulbar lesions, aneurism, insular sclerosis, syringomyelia, etc., all of which, however, generally have some accompanying sensory signs. The object of this article will be accomplished if I succeed in directing attention to the great necessity there exists for further and closer investigation into physiology and pathology as applied to laryngeal disorders similar to these cited herein. At the present day it is impossible to interpret

and foretell the exact significance of, and give a definite prognosis in, such anomalous cases as I have quoted, and I think a very careful record should be kept of all similar cases and reports made from time to time to enlighten us on what is thus far, to some extent at least, a terra incognita. I doubt if I would ever have reported these few cases had not discussion arisen between a neurologist and myself on this question, who maintained that the literature on unilateral cord palsy as related to tabes dorsalis was very meager, and if my experience could be established it would spell "originality." Perhaps one reason why unilateral cord paralysis has so often been attributed to hysteria, when there did not exist any other discernible lesion, is the infinite variety of forms which hysteria causes in what we term "nervous" subjects, and we may be inclined to fall back on this diagnosis when otherwise at fault, since the word "idiopathic" is no longer tenable. To prove of any value these silent cord palsies must be followed to a finish, and we all know how difficult it is to keep patients under observation who have no tangible evidence to themselves of the necessity for carrying it out. Herein lies the chief obstacle to establishing data in such cases, and of course these few instances quoted of the trouble in question are comparatively valueless, for it requires an extended series to prove any unusual records. In estimating the value of this objective sign we must also remember that many subjects of tabes have had syphilis, some authors maintaining that the one disease entails the other, or indicates the other, so that a true luctic palsy may coexist with tabes.

XLII.

NASAL MYXOSARCOMA IN A CHILD OF THREE YEARS.

BY GEORGE T. ROSS, M. D., D. C. L. (HON.),

MONTREAL.

Emile Lalonde, aged 3 years, of French-Canadian parentage, born in Montreal, was brought to the Western Hospital, with a history of obstructed nasal breathing for six weeks past. It was impossible to obtain much reliable information from the parents, who had not noticed anything specially wrong until epistaxis begun. There was no account of injury or hereditary cancer. Child was never ill before present complaint. His appearance was normal except anemia, not very pronounced. Recently there was marked obstruction to nasal breathing, especially at night. No cough, but the voice had a so-called nasal tone. Epistaxis very frequent.

Examination of the nose showed right side practically normal. In vestibule of left naris a greyish yellow mass was seen, blocking it entirely. This was found to be of soft consistency with pus covering it. It was encapsulated, very friable and bled at the slightest touch. No fetid odor or excoriating surface of the upper lip.

Operation.—Under general anesthesia I removed the growth with forceps scissors and electric cautery. It was found diffusely attached to the septum at the bony and cartilaginous junction. The resulting hemorrhage was severe, but easily controlled. In two weeks the tumor recurred, but was much less in size. This recrudescence was controlled by operation every two or three weeks, each time the growth being smaller. After the fifth operation the child was not brought back to the hospital.

PATHOLOGIST'S REPORT.

Pathological Laboratories,

Western General Hospital, Montreal.

Growth from Nasal Septum.

13th November, 1908.

Baby Lalonde.

Material for examination consisted of small snippings and one or two round nodules, which on section were of a white

homogeneous appearance. Microscopically one of these larger nodules showed at one side a loose reticulum with some stellate and pointed cells, with here and there scattered round cells, having one or more nuclei; the single nucleus was often in a state of division and occasional nuclei were fragmented. At the margin there was a uniform matting together of round cells, having deep staining single nuclei or nuclei in process of fragmentation. The section gave the appearance of a myxoma or a hypertrophied nasal mucous membrane which had undergone sarcomatous transformation. Diagnosis—Myxo-Sarcoma.

A. G. NICHOLLS, M. A., M. D.,

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Remarks.—The child's condition did not seem to suffer much during operative treatment notwithstanding the severe hemorrhage from time to time. The difficulty of treating a child of 3 years and keeping the wounds clean after operations, can be best appreciated by those who have done it. In this case the mother declined to allow the child to remain in hospital and so the home care was inefficient and consequently detrimental. Several specimens were sent from time to time to the pathologist who found such examination confirmatory of previous opinions. No glandular involvement. Half a year after the last operation I examined the little patient and found the left naris normal except the scar tissue on the septum, showing the site of former growth. The parents reported the child's health perfect.

Price Brown gave a statistical report in October, 1906, of results of operations in sarcoma of the nose by various methods generally adopted and these were collated from many authors whose records were thought worthy of citation. He found that operators who had as many as 20 cases did not trouble to keep records of them, being impressed with the hopelessness of the disease in question. The summary of the work referred to, whether operations were done internally or externally, in which patients were observed until final results were obtained, was that out of 51 cases 27 per cent recovered after operations of whatever kind. After intranasal work, however, it was noticed that the recoveries were 31 per cent as against 24 per cent after the extranasal method, while some cases had to be done both ways. Brown's personal record of

4 cases were all treated by intranasal electric cautery, and while three recovered perfectly, the fourth died of sepsis.

Although the results in nasal sarcoma are usually very fatal and recoveries after operation constitute a very small proportion, yet in this case the early destruction of the growth may tend to more favorable outlook, even if this is offset by the disease manifesting itself at such a tender age. Some authors maintain that more than half of these cases are fatal ultimately no matter how they are treated.

XLIII.

AURAL COMPLICATIONS IN THE EXANTHEMATA.

BY CHARLES R. C. BORDEN, M. D.,

BOSTON.

In the minds of the profession at large, diphtheria is regarded as the first of the three contagious diseases developing aural complications, scarlet fever next in frequency, and measles last and least. As a matter of fact, measles is first, scarlet fever second, and diphtheria is low in the percentage of ears involved. Statistics vary somewhat with the different writers, but all agree with the foregoing statement of relative frequency.

In the Boston City Hospital Dr. McCollom¹ reports 24 per cent in measles and 18 per cent in scarlet fever. Downie of Glasgow², reports 26.1 per cent in measles and only 12 per cent in scarlet fever. Caiger³ reports 11 per cent in 4,015 scarlet fever cases; Burkardt⁴ 33 per cent and Finlayson⁵ 10 per cent in 4,339 cases of scarlet fever. In a series of cases observed by the writer, but 1.3 per cent developed aural complications in diphtheria. Thus will be noticed the striking difference between the three diseases.

Naturally, more complications will arise in severe infections, in septic cases, and in those having especially acute throat or nose symptoms. Bronchopneumonia, a common complication of the eruptive diseases, causes not only middle ear inflammations, but many mastoids as well, and profuse nasal discharges, so common in these diseases, are particular enemies of the ear.

No hard and fast rule may be given as to the time of onset. But in a general way it may be said that in diphtheria and measles, the complications usually occur soon after the acute symptoms have developed. This is particularly true of measles. But in scarlet fever, middle ear infections may be expected any time, from the first to the last day; more frequently late in the period rather than early. Many cases are seen in the Boston City Hospital from forty to one hundred

days after admission. Of course the complications may arise at any time and do so in each of the three diseases with sufficient regularity to prevent any special rule being made. But in a larger number of cases, the general course will agree with the above statements.

The course of the complications ranges over a wide area. Beginning with the slight earache or simple deafness, they occasionally extend to acute mastoiditis with alarming complications. At the onset there is no means of knowing to what extent they may progress; consequently it is the duty of the attending physician to exert his greatest skill in each and every case.

Diagnosis to skilled aurists is usually easy. It sometimes happens, however, a case is seen which is exceedingly hard to diagnose, and will cause considerable anxiety before the true nature of the condition is decided.

In my experience, more obscure cases of mastoiditis have developed in diphtheria than in either of the other two diseases. As a rule, mastoid involvement in diphtheria is less active in its symptoms and less typical in a general way.

In scarlet fever and measles, the usual pressure symptoms are prominent and unmistakable, and upon operation, free pus is found in quantity. In diphtheria, not only are the symptoms less active, but in some cases, on operation, pus is usually small in amount and occasionally is not found at all. I have seen several cases in this disease, in which diagnosis was made entirely by exclusion, no typical symptoms being present. On operation no pus was found, yet recovery was complete and rapid, the lesion being probably an infective osteitis.

The ordinary course of the aural complications, is to develop a simple middle ear inflammation, to rupture spontaneously, to discharge serum, sero-pus, or thick creamy pus; to persist from a day or two up to several weeks, and to heal without further trouble.

Were this all that might take place, little or no harm would result. Unfortunately, many cases fail to be arrested in the acute stage, but pass on into a chronic process, which occasionally persists for a lifetime.

In measles, mastoiditis usually develops soon after the acute stages of the disease are present. In scarlet fever and diphtheria, especially in scarlet fever, it frequently arises after pital many mastoids have developed from three to ten weeks

the discharge has become chronic. In the Boston City Hospital after admission, and it is the rule rather than the exception for them to arise late in the diseases of scarlet fever and diphtheria.

In both children and adults, aural symptoms differ somewhat from those of other causes, a very prominent and striking difference being the absence of pain. Perhaps 80 per cent of the children seldom complain of this symptom. The majority of cases show the first evidence of middle ear complication by a spontaneous rupture of the drum membrane together with a discharge more or less profuse in amount. At times the first symptom will be a sudden rise in temperature, with no apparent cause. Inspection will show a bulging drum membrane of a grayish red color. Even with a marked bulging of the tympanic membrane, pain is frequently absent. Incision of the drum membrane in this case quickly restores the temperature to normal. In adults, pain is more frequently observed, but cases are often seen with bulging drum membranes and elevated temperature who have little or no distress from pain. As a rule, when pain is present, it is by no means as severe as in cases of acute otitis from grippe, pneumonia, etc.

In nearly every case seen by the writer, spontaneous rupture takes place near the same location. This is a spot near the lower margin of the membrane, immediately below or a little behind the umbo. The writer has seen few cases rupture far from this location. This is a very fortunate circumstance, and doubtless explains why so many cases recover in spite of the absence of scientific treatment. The character of the discharge varies in the different diseases. It usually begins with a thin serous fluid, sometimes tinged with blood. A few cases continue so for a few days and cease. The ordinary course, however, is to soon change to creamy pus and continue for a week or two, gradually becoming less and less, until dry. Diphtheria as a rule, causes a thicker discharge and less in quantity, than the other two diseases. By all means the most characteristic discharge is seen in measles. In practically every case there is a profuse, brownish-white fluid with less of the creamy nature of pus. The amount is usually tremendous, and it causes more destruction of the membrane than any other aural discharge.

In my opinion, when such a condition exists, and daily inspection shows the perforation in the drum membrane rapidly

becoming larger, a mastoid operation should be done at once, without waiting for other symptoms, in order to save the hearing apparatus from further injury. I have performed this operation a number of times for this condition, and have never failed to find the mastoid cavity filled with pus and soft granulations.

In many cases the discharge will be great in amount, yet inspection of the drum membranes will fail to show any redness or bulging of that organ. Such cases usually heal without any special difficulty. Other cases, however, will show redness and bulging, and offer great difficulty to recovery and a greater menace to future hearing. Frequent incisions are sometimes called for and much good accomplished thereby. As a rule, however, when frequent opening of the membrana tympani is demanded in a case, a mastoid operation should be seriously considered, with a view to establish drainage backwards through that bone. Pus from the middle ear is frequently kept active by profuse nasal and nasopharyngeal secretions, and will persist as long as this cause is present. I have frequently performed adenoid operations for the relief of both conditions in scarlet fever and measles, with most gratifying results.

An adenoid operation during one of the infectious diseases would seem at first strongly contraindicated. It may be done, however, when necessity demands, and splendid results follow in scarlet fever and measles. This does not apply to diphtheria, however, as dangerous sequelae have followed the procedure in this disease.

Sudden rises in temperature in the exanthemata, without apparent cause, are usually due to ear complications. Inspection shows a bulging membrane, the color and appearance of which are quite different from the ordinary acute ear. The color is a grayish red and not the deeper red usually seen. The bulging assumes a flattened condition extending over the entire surface, also quite different from the ordinary, and is characteristic in a way of the exanthemata. When incision is performed on this drumhead, a distinct feeling of resistance to the knife is encountered, giving a thick, porky sensation. This thickened, infiltrated condition of the membrane undoubtedly accounts for the color, flattened appearance, and absence of pain.

The temperature seldom remains elevated after good drainage becomes established.

Except in diphtheria, acute mastoiditis is usually prominent and unmistakable.

The absence of pain is frequently noted, and in children it is not the first symptom to excite attention. In many cases, in young children, the first evidence of trouble is a sudden marked bulging forward of the auricle, together with edema and swelling over the mastoid. Tenderness is present on pressure over the swelling, and within the canal are found the typical mastoid symptoms.

One of the most striking features of aural work in the exanthemata, is the alarming frequency of mastoiditis in adult measles cases.

Dr. David N. Blakely⁸ has published valuable statistics on this subject. In a series of 341 patients ill with measles, he reports that 14.96 per cent developed middle ear inflammation. Of this number 11.76 per cent of the cases having discharging ears came to a mastoid operation. Of the 6 patients having mastoid operations, five of them were in adults. The sixth occurred as a secondary operation in a child who had previously been operated on in another institution before admission to the Boston City Hospital. He further states that in 81 adult scarlet fever patients, not one had middle ear involvement of any kind.

In two series of mastoid operations of my own, 44.44 per cent and over 50 per cent occurred in adult patients having measles. In these two series of cases no mastoid operation occurred in adults ill with scarlet fever.

Adult scarlet fever patients occasionally develop middle ear inflammation, but mastoiditis among them is comparatively rare.

Thus it will be seen that in measles, adults are in considerable danger from mastoiditis, while in scarlet fever the danger is comparatively slight, even with middle ear inflammation present.

In conclusion I wish to emphasize the following points:

- (1). In scarlet fever, children are quite liable to middle ear inflammation which may or may not involve the mastoid cells. Adults are much less so, and rarely have mastoiditis.
- (2). In measles both adults and children are very susceptible to middle ear involvements and adults are especially in danger of mastoiditis.
- (3). In cases where there is a tremendous aural discharge present for more than two or three weeks, the mastoid opera-

tion should be seriously considered as a means of providing drainage, other than through a small pin hole perforation in the delicate membrana tympani.

(4). Occasionally a case will arise, in which the diagnosis may be difficult. If, after carefully ruling out every other possible cause by exclusion and the mastoid remains in doubt, if the symptoms of the patient are at all serious, operate. The danger is greatest from waiting.

(5). If after the acute symptoms of scarlet fever and measles have subsided, pus in the middle ear is kept active by profuse nasal or nasopharyngeal discharges, examine the patient for adenoids. If the growths are present remove them thoroughly. This procedure in the course of diphtheria, however, is questionable.

(6). General practitioners should regard aural discharge as a menace to hearing, and occasionally to life, and not as a more or less common complication without special importance. In a series of 1164 cases previously reported by the author⁷ in children up to 16 years of age, having aural diseases, 31.6 per cent had chronic purulent otitis media of long standing.

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XLIV.

NASAL TUBERCULOSIS—A CASE AND REMARKS.

BY W. SCOTT RENNER, M. D.,

BUFFALO.

The patient, whose case I am about to report, was a robust, healthy looking woman, 28 years of age and weighing 180 pounds. She came to consult me on April 16th, 1908, from a remote country district of western New York.

She complained of complete obstruction of both nostrils, which gave her great discomfort in breathing, interfered with her sleeping and produced a characteristic intonation of the voice. She stated that this condition had been coming on gradually for several months and was accompanied by a profuse malodorous discharge.

Upon examination I found both nasal fossae completely obstructed by a pyriform tumor occupying the position of the nasal septum. My first impression was that the tumor was probably an abscess of the nasal septum, but closer examination revealed the fact that the side of the tumor encroaching upon the lumen of the left nasal fossa, was a marked deflection of the septum to that side, and that the mucous membrane covering it was normal in character and directly in contact with the cartilaginous portion of the septum, where it belonged. The projection into the right nostril was a dark red and somewhat lobulated tumor, completely filling the fossa, whose surface had been more or less altered in appearance by two or three lines of electric cauterization. The tumor was elastic in character, not dense.

I made a provisional diagnosis of sarcoma, removed a specimen for microscopic examination, prescribed a placebo and requested the patient to return in about a week. The pathologist, Dr. Charles Bentz, of the University of Buffalo, returned a report of his examination, stating that the tumor was a characteristic tuberculous growth containing giant cells, etc., and that he had discovered tubercle bacilli in several of the microscopic slides from the specimen.

When the patient next visited me I removed the growth

piecemeal, with snare and curette, until I reached the underlying cartilage and healthy mucous membrane, posteriorly and at the suture between the bony and the cartilaginous portion of the septum. When I had, in this manner, removed the growth from the septum, I discovered that the anterior portion of the lower turbinate of the same side was indurated and superficially ulcerated. The floor between the two tumors was likewise ulcerated.

The following day I removed most of the anterior portion of the inferior turbinate, with scissors and forceps, until no more evidence of disease was discernible. At this and at subsequent visits I thoroughly cauterized the wound surface, on both the septum and the outer nasal wall, with lactic acid. I also cauterized the edges of the wound, where the mucous membrane appeared normal, with an electric cautery. The wound surfaces were kept separate by packing with iodoform gauze until the wounds had healed.

This patient has a good family history, free from tuberculosis. She has an old scar in the cervical region, and gives a history of glandular abscess in childhood. She has four children, one of whom, she says, has "lung trouble." But I have never had an opportunity to examine this child.

I referred the patient to Dr. De Lancey Rochester, of Buffalo, for an examination of her chest. He reports as follows: "I find no disease of the lungs here. Heart is not very strong. There is history of old gland abscess in the neck," etc.

At no time, while under my care, did the patient have any rise of temperature. Since her recovery from the local lesion it has been impossible to carry out any systematic treatment of the case. However, I prescribed potassium iodide and recommended tonics and out-of-door life. Had she been able to visit the city from time to time I should have instituted tuberculin treatment.*

Whether this should be considered a primary infection of the individual is questionable. As already mentioned, she has an old scar, on the neck, of a lesion which was probably active twenty years ago and may, or may not, have been tubercular. The nasal infection, I should judge, commenced as a tuberculoma of the nasal septum and subsequently infected the lower turbinate. The infection may have started as a "contact infection" of an erosion of the concave cartilag-

*This case was seen by the author on May 28, 1909, when no evidence of a return of the lesion could be detected.

inous portion of the septum, and not by secretion from the patient's lungs. Or, she may have been infected by the secretions from her own child, seven years old, who may have tuberculosis.

This is reported as a typical case of nasal tuberculosis, which usually commences in the cartilaginous portion of the nasal septum, as a tuberculoma. The usual classification of the various forms of nasal tuberculosis is that suggested by Gerber in Heymann's Handbook and adopted by Prof. Gleitsmann in his report at Vienna last year. It includes tuberculous ulcer, diffuse infiltration, tuberculoma and lupus. A simpler division is: true tuberculosis of the nasal mucous membrane and lupus of the nasal mucous membrane.

Tuberculous infiltration and tuberculoma are identical in character. The latter is simply a greater elevation of the diseased tissue above the surface attacked by the infection. Both of these undergo some ulceration in time. These two forms are supposed to be primary in character, and differ, in this respect, from the tuberculous ulcer of the nasal mucous membrane, which is a secondary infection.

Although tuberculosis of the nose is a comparatively rare disease, a sufficient number of cases has been reported, and critically studied, during the past fifteen years, to establish their clinical characteristics and etiological factors. Up to the time that Prof. Chiari wrote his paper, in 1894, on "Tuberculoma of the Nasal Septum," only twenty-one cases, including six of his own, had been reported. Since that time the number of cases reported has rapidly increased and exhaustive articles have been written upon the subject by Gerber, Pasch, Caboche, Gerst, Katz and others.

Authors who come into contact principally with cases of pulmonary tuberculosis, have, with very few exceptions, contributed very little to the literature on this subject; and the cases which they have reported have been those of simple ulceration without any perceptible proliferation of tissue. This is the form of tuberculosis which occurs in the nose in advanced pulmonary conditions which is like that found in the pharynx in advanced phthisis. For instance, Karl von Ruck, in his report on the treatment of pulmonary tuberculosis, in 1903-04, cited eight cases, and, in his report of 1905-06, he reported six cases, all of which were ulcerative in character. Caboche states that of twenty cases of tuberculous ulcers of the nasal mucous membrane, which he collected from the

literature, eighteen appeared as the ultimate manifestation of pulmonary phthisis.

The poliferative form of nasal tuberculosis is considered to be primary, and most of its characteristics are illustrated by the history of the case just cited. It occurs, usually, in people of robust health who have no other active tubercular lesions, although evidences of latent tuberculosis may be found in other organs. For instance, the patient whose case I have been considering has a scar on her neck, and may also have some undiscovered latent pulmonary lesion.

The tuberculous tumor, or tuberculoma, is of the type of so-called primary infection of the nasal septum. Its presence is discovered by the symptoms of nasal obstruction. Examination, in such cases, reveals a tumor of variable size, starting from the typical spot on the cartilaginous portion of the nasal septum and varying in color, according to its vascularity, from gray or pale red, to dark red. This description may also apply to any tumor of the nasal septum. - Tuberculoma, when not removed, may, in time, undergo coagulation necrosis and, possibly, become an ulcer. The process usually commences on the cartilaginous septum, and other tuberculous lesions in the nose are the result of infection from it, by contact and continuity of surface; it may thus extend to the floor of the nose, the turbinates, the ethmoid, frontal and maxillary sinuses. Infection may start in other parts of the nose, but rarely. It may also occur on the vomer and extend through the nasal duct to the conjunctiva.

Caboche claims that all primary infections of the nasal septum are lupic in character; and that twenty-nine out of forty-four cases of tuberculoma of the nasal septum, which he collected from the literature, were undoubtedly lupus; and of twenty-one observations of tuberculous infiltration of the nasal mucosa, only four are probably lupus; all the others, seventeen in number, are absolutely lupus. He sums up by saying: "There are only two forms of nasal tuberculosis: miliary tuberculosis and lupus, which comprises tubercular tumors and the majority of tuberculous granulations."

Lupus of the nasal mucous membrane has all the histologic characteristics of other forms of nasal tuberculosis and is distinguishable only by the clinical manifestations. Many authors believe that lupus of the face always commences in an internasal lesion from an infection of the nasal mucosa, and that as the lesion produces no symptoms until the skin

is attacked, it is first seen by the dermatologist who rarely pays much attention to the interior of the nose until destruction takes place.

The difference between primary tuberculosis and lupus is not always acknowledged by others than dermatologists. Much that is claimed to be lupus by some is called tuberculosis by others. Hajek, Michelson and Zarnico have entirely given up the classification into nasal tuberculosis and nasal lupus, and speak only of nasal tuberculosis. As we have already seen, Caboché and others claim that all primary intranasal tuberculosis is lupic in character; while, on the other hand, Moritz Schmidt, and many other authors, devote a separate chapter to lupus of the upper air passages.

Primary infection of the nasal mucous membrane is more rare than one would expect from its location, because the nose is protected by weapons of defense in the ciliary epithelium of the mucous membrane and the bactericidal qualities of the normal nasal secretion. Tubercle bacilli, and other pathogenic germs, have been found in the nasal cavities of healthy people by many investigators, especially in people, such as nurses and attendants, associated with tuberculous patients. Inoculation may then occur through defects in the epithelium, through excoriations and erosions. This part of the nose is also subject to the insults of the scratching finger and to the use of the soiled handkerchief of some infected person. As has already been stated, the tuberculous ulcer is a secondary infection in patients with pulmonary phthisis.

Some authors claim that all nasal tuberculosis is a secondary ascending disease; yet some, on the other hand, assert that every case of facial lupus has its origin in the nasal mucosa. Many cases that are apparently primary in origin, are, in reality, secondary to some latent lesion in the lungs, or some other organ, which cannot be recognized by any means of physical diagnosis. Consequently, it is almost impossible, during life, to make an absolute diagnosis of primary infection, for we know how often latent tubercular lesions are found postmortem. X-ray examination of the lungs is now being practiced and will probably bring to light many undiscovered lesions.

The tubercular nasal ulcer is usually easily diagnosed from its characteristic appearance and from its association with pulmonary phthisis. The proliferative form can be absolutely diagnosed from histologic findings only. It is usually

unaccompanied by pain or fever. The diffuse infiltration may resemble a specific infiltration, which is differentiated by the therapeutic test, although the two diseases may coexist.

Tuberculoma is not apt to be mistaken for syphilis. Syphilis rarely produces as large a tumor as tuberculosis. The tubercular tumor may be confounded, until examined histologically, with papilloma, fibroma and sarcoma. Onodi, for instance, diagnosed a case as carcinoma of the nasal septum, from the clinical picture and the microscopic examination of an excised portion. After radical removal of the tumor, it proved to be a tuberculoma. Pasch and Gerst describe cases of infiltration of the nasal mucous membrane, which are not distinguishable from true hypertrophy of that membrane, producing neither defects nor prominences, as illustrative of this condition. Gerst describes, among others, a case of a woman fifty-eight years old, whose right lower turbinate was uniformly enlarged, posterior extremity much enlarged with irregular surface and dark red in color. This turbinate only partially collapsed on application of cocain and adrenalin, the posterior extremity remaining unchanged. The anterior part only partially collapsed and was anemic, showing dark red colored spots prominent and circumscribed. The left lower turbinate also appeared hypertrophied without the posterior extremity being especially enlarged, and it reacted pretty uniformly to the cocain and adrenalin. After that the middle turbinates were visible and unchanged,—septal mucous membrane normal. The excised posterior extremity of the right turbinate was found to be tubercular. After discovering this, the left lower turbinate, and the mucous membrane on both sides of the septum, were removed and found to be tubercular. The only rhinoscopic changes were in the right lower turbinate, yet, the nasal mucous membrane was found to be extensively tubercular.

In conclusion and by way of summary I would say that, clinically, nasal tuberculosis may be divided into three classes:

First. The tuberculous ulcer, occurring in advanced phthisis, which is usually discovered by the specialist in that line who adds to his pulmonary examination a systematic inspection of the upper air passages, as was cited in the case of von Ruck, who reported fourteen ulcerations of the nasal mucosa in five hundred and fifty-four cases of pulmonary tuberculosis.

Second. The tuberculous tumor and infiltration, for which

the patient consults the rhinologist for nasal obstruction.

Thirdly. Lupus, cases of which are usually diagnosed by the dermatologist after the tubercular lesion of the mucosa has extended to the skin of the nose and face.

The last two are primary in origin and are more accurately termed tuberculosis, rather than lupus. In my opinion, the term "lupus" could, with impunity, be dropped from our nomenclature.

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XLV.

SOME OBSERVATIONS UPON THE COMPLETE
EXTIRPATION OF THE DISEASED FAUCIAL
TONSIL.

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A series of 100 cases of tonsillectomy in an institution in which the comforts and care of a private home were thrown around the patient gave an admirable opportunity for the observation of the after-effects of this operation and also for contrasting it with previous operations of tonsillotomy in the same institution.

This institution, the Girard College of Philadelphia, admits the pupils at the age of 6 years—and they remain until they are 18 years. The boys are given a good education and it is the policy of the management to provide as nearly as is possible a home life for them. Under the will of Stephen Girard, the founder, boys who are orphans or half orphans (having lost a father) are eligible.

Before admission, the applicant must pass a physical examination, which includes an examination of the nose, nasopharynx and pharynx. Cases which are believed to be affected with disease of the latter parts are set aside by the resident physician for a subsequent examination by myself. So that the cases selected for operation are typically healthy boys, save for the secondary conditions engendered by mouth breathing.

Incidentally a fair idea of the prevalence of tonsillar and adenoid hypertrophies among this class of patients is obtained by this rigid entrance physical examination. In a recent class of applicants in 102 boys, 36 were found to have either hypertrophied tonsils or adenoids or both. Only those cases were classed as necessitating operation in which (1) the tonsils were so large as to be evident to a casual observer. (2) Those in whom the tonsils were buried and covered by the pillars. (3) Those in whom the crypts and surrounding parts gave evidence of attacks of tonsillitis.

Of the 100 cases which serve as a basis for these observations, 65 were operated within one week, so that they were all in the infirmary at or about the same time—the remaining 35 were done within six weeks of each other and were practically consecutive. The cases are prepared for operation in the same manner as for a major surgical operation. Admitted to the infirmary the day before operation; purgative the night before, and the usual preparation for anesthesia.

An anesthetic was administered in every case except in a few older boys with simple nonadherent hypertrophied tonsils. The method adopted for the removal of the tonsils is as follows: The tonsil is firmly grasped by a forceps—the forceps which has served me best after trial of a number of varieties is that sold in the shops as the Mikulicz broad ligament forceps—the tonsil is firmly pulled from its bed by an assistant and the attachment to the pillars severed by the Allis blunt dissector. In many cases the attachment is so firm as to cause considerable tension of the surrounding tissues. Rather than exert force to sever these firm adhesions it has been found wise and expedient to effect separation by means of a sharp instrument, either a properly constructed scissors or tonsil knives. Having effected a thorough separation of the pillars, the finger is introduced and an endeavor made to break up the deeper adhesions and to leave the tonsil hanging, as it were, by a shred of tissue. The forceps still in place, a strong wire snare is passed over the handles, down over the tonsil and around the shred of tissue and slowly drawn home.

In most cases this method has been found to be exceedingly satisfactory,—enucleating the tonsil from its bed often with the capsule attached.

In some cases, however, and especially is this so in the so-called buried tonsil, the gland is so adherent to the surrounding parts and its tissue so friable as to make it difficult for the forceps to retain their hold. Many of these will yield, however, by a proper amount of patience—but there are some which will not. In these latter by effecting as free a separation as possible it is a comparatively simple matter to engage the tonsil within the bits of a good punch and complete the removal.

There are still other cases in which owing to frequent inflammatory attacks the tonsil is not only adherent, but so bound down by adhesions as to resist all efforts to separate by blunt dissectors. In these sharp separators are used and the punch

employed to complete the operation. The results of these operations have been most gratifying. This method has been employed by me in a desultory way for several years, but no opportunity had arisen to study the effects in a consecutive series of cases until these now reported, presented.

Every laryngologist has been disappointed at times in the use of the tonsillotome. We have all seen cases of so-called recurrences of the hypertrophy, which simply means that in most instances the operation was not a complete one. Again, we have realized what an ineffective instrument the tonsillotome was in the so-called buried tonsils. It seems to me apparent that if it becomes necessary to remove a tonsil at all only a complete extirpation is indicated.

We know that the crypts which are the part of the tonsil singularly subject to diseased conditions, extends down to or near the capsule; therefore, if a piece is sliced off the tonsil we effect only an increased breathing space in the fauces and this at times only temporarily, while the crypts below the incision remain diseased and a possible source of infection.

Whatever function the tonsil possesses is necessarily abrogated by the conditions already enumerated and which we recognize as diseased conditions; therefore, if it is necessary to remove a tonsil, it should be done in as complete a manner as is possible. Of course it is important that care should be exercised in the selection of cases. No tonsil should be removed unless it is diseased and ceases to be a functioning organ.

In my first case by this method I was considerably chagrined by the severity of the reaction, but experience taught me to reduce this to a minimum. One of the first lessons learned was to employ as little force as possible. It is far better to employ a sharp instrument to sever refractory adhesions than to stretch the tissues until they break. By the latter is induced a cellulitis with subsequent infection and prolongation of the post-operative effects. The same may be said of the too strenuous use of the finger in breaking up the adhesions. It is far better to snip the tissues with a curved scissors or depend upon the wire for the severance. Another important matter is that the pillars shall be entirely free and not included in the grasp of the snare when the final severance is effected. However, even where the greatest care is employed the reaction is at times more pronounced than in the use of the tonsillotome.

Let us study the 100 cases: As an evidence of the usual care given the boys in this institution and not because of the necessity, the operated cases were retained in the infirmary from 2 to 7 days after operation. The average time was 4 days. This long stay afforded an exceptional opportunity to study each case. The efficient resident physician, Dr. Trinder, looked after the cases daily and kept careful notes of any departure from the normal. Again, even after the discharge from the infirmary, the boys remained in the institution and have all been seen from time to time since the operation. It is now a year since the first 65 cases were operated.

As to the temperature range: In 90 per cent of the cases the thermometer registered a temperature between 98-101, and in the larger number of these did not rise above 99. In 9 cases the temperature amounted to 102 and over. The first group, namely, those whose temperature remained below 101, were the type of case mainly with simple hypertrophied tonsil and slight attachment to the pillars. There were, however, quite a few in whom the tonsils were submerged and firmly adherent. In this group there was very little faucial disturbance. While the extent of removed tissue was observed by inspection to be more extensive than is usually seen after a tonsillotomy, the subjective symptoms were not thereby increased.

Later, when the effects of the traumatism had entirely disappeared and the boys were about their usual duties, an examination of the throat disclosed a perfectly normal fauces except that there was not a vestige of tonsil remaining.

The group of 9 cases with excessive temperature were those in which the tonsils were firmly adherent to and submerged beneath the pillars. Most of them were cases in which the tonsil had been the site of repeated inflammatory attacks and its tissue was soft and friable—requiring much dissection and the use of the tonsil punch—hence, unusual traumatism. In these cases there was in addition to the systemic disturbance, both objectively and subjectively, marked faucial symptoms. The patients complained of much difficulty and pain in swallowing. In two there was regurgitation of fluids through nose. The fauces were indurated in the region of the half arches, and the tonsillar wound was the site of a superficial ulcer covered by a slough.

All of these cases made a good, though tardy, recovery and subsequent examination revealed a normal fauces except

that the tonsil was absent. It is not at all unlikely that much of the disturbance noted in this last group of nine cases might have been avoided had recourse been made to sharper instruments to effect a separation of the adhesions. These were among the early cases and at that time the lesson had not been learned to avoid as much as possible undue traction on the surrounding tissues which the use of dull dissectors and the finger is sure to produce in firmly adherent cases. Many cases as difficult have been operated since with no more disturbance than in the first group recorded.

In contrasting tonsillectomy by the method described, with previous operations, tonsillotomy, the first point to which I would direct attention is the thoroughness of the operation. Tonsillectomy leaves little to be desired so far as complete ablation of the tonsil is concerned.

Tonsillotomy on the other hand effects a complete extirpation only in those cases in which there are no adhesions or in which there is slight attachment to the pillars. In the large class of submerged or buried tonsils this operation effects in some cases only a partial removal which is almost useless, and in others it is impossible of execution.

As to the after-effects of the two operative procedures: It has been pointed out that in by far the larger number of cases, namely, 90 per cent, there is practically no severe symptoms following the tonsillectomy, the fauces clear rapidly and cleanly and leave no permanent injury or disfigurement. This is as good a result as tonsillotomy shows. It is true that in 9 cases there was unusual systemic disturbance and faucial ulceration and edema succeeding the operation. These cases, however, were all of the deeply submerged, adherent type of cases, requiring much dissection to free.

A type of case is familiar to every laryngologist in which it is necessary to grasp the tonsil firmly with the forceps and pull it from its bed to demonstrate the hypertrophy and then frequently to find it surrounded by a tightly adherent, thinned-out pillar or fold. This, then, was the character of the cases in which excessive reaction followed the dissection and removal.

No comparison can possibly be made between the two methods of operating in cases of this nature, for the reason that the tonsillotome is absolutely incapable of removing such hypertrophies, except the adhesions be first separated, the tonsil pulled from its bed and the tonsillotome used to cut

off the remaining shred of tissue from the base. In which case, it simply takes the place of the snare used in the latter part of the operation described and is infinitely less satisfactory.

As to hemorrhage: Tonsillectomy has effected a great change in the operation room in these cases. It is rare to see profuse bleeding by this method for the removal of tonsils. In two cases of the group reported, there was an unusual amount of bleeding—in both of which the cause was a spurting vessel, which clamping with a hemostat readily and quickly controlled. The amount of hemorrhage in a given case is largely under our own control—the more rapidly the snare is tightened the greater the liability to bleeding, for it then approaches a knife in incisive qualities—the more slowly it is drawn home the more crushing force it possesses and the mouths of the vessels are closed. It is only necessary to recall the many anxious moments every operator has experienced in the past when he has successfully excised a large tonsil to find the buccal cavity filled with blood and more blood welling up from a large bleeding area, and contrast it with the proceeding under consideration where only a little oozing follows the snare,—to realize the tremendous advantage in this one particular the modern method affords.

The contention then is, from a study of these cases, that:

(1). Tonsillectomy is the proper operation for the removal of diseased tonsils.

(2). That tonsillectomy in the majority of cases results in no more serious traumatism to the faucial tissues than does tonsillotomy.

(3). That in those cases in which marked systemic and faucial disturbance follows a tonsillectomy it results because of the difficulty attending a separation of adhesions and that these latter cases are totally unsuited for the operation of tonsillotomy.

(4). That tonsillectomy is always a completed operation. Tonsillotomy is only occasionally completed.

(5). That hemorrhage after tonsillectomy is slight and largely under the control of the operator. In tonsillotomy, hemorrhage is often profuse, at times serious.

XLVI.

STUDIES CONCERNING THE SURGICAL TREATMENT OF OTITIC MENINGITIS.

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VIENNA.

(FROM THE EAR DEPARTMENT OF THE GENERAL POLICLINIC,
VIENNA, G. ALEXANDER, M. D., DIRECTOR.)

Translated with permission of the author from *Archiv für
Ohrenheilkunde*, Vol. 75, p. 222, and Vol. 76, p. 1, 1908.

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The progress in the surgical treatment of otitic cerebral diseases has necessarily drawn attention to otitic meningitis. Whereas before in this disease the prognosis was considered as absolutely unfavorable, so that any surgical treatment had been dispensed with from the very beginning, we now report quite a number of operatively healed cases. At this time it is our purpose to introduce a methodic operative treatment of meningitis by classifying and analyzing the material. In so doing we have come to the conclusion that we profit only very little from the autopsy of cases of meningitis with regard to the surgical part of the question; indeed, if we were to judge only by the anatomic cases which previously often enough were the only determinative factor, the possibility of a regular surgical treatment would appear a priori doubtful. Authors have repeatedly referred to the fact that the thick exudate between the soft cerebral membranes, extending deep and far into the sulci along the cerebral surfaces, was absolutely inaccessible for drainage. Besides, if we consider the fact that the inflammation in the majority of cases is not limited to the meninges, but also involves the superficial layers of the brain

tissue, a surgical treatment appears even less possible. If we therefore consider only those cases of meningitis whose termination we have been able to witness, i. e., those whose severity finally causes death, we should have to negate the question of healing purulent meningitis and be sceptic towards the reported cases of successful healing.

The clinic, however, furnishes a different view. We have known for a long time that in the course of many middle ear affections, meningeal processes of a specially light form may appear that quite frequently disappear after a few days, sometimes even after a few hours, although in some cases healing occurs only after some time. We are aware of the fact that types of meningitis, the purulent character of which has been positively proved, may also heal. The whole question has become confused by calling the light meningeal processes, without any exact clinical examination, "meningeal irritation phenomena" or "meningeal congestion," little attention being paid to them; whereas, on the other hand, our point of view is that in these cases of healed purulent meningitis we meet with microorganisms of low virulence and the co-operation of a series of favorable circumstances unknown to us. Finally, quite a prolonged discussion arose concerning the circumscribed and diffuse forms of meningitis. Stress has also been laid upon the varying degrees of intensity of the meningitis, in which case, however, only the degree of the clinical phenomena could be determined. The lumbar puncture has proved to be a factor, by no means unimportant, for the classification of such cases; yet, we have found at this clinic, also, that a classification of meningitis by the lumbar puncture is not possible for all cases, so that it is unfortunately without decisive importance for the question of surgical interference.

A thorough study of the cases of otitic meningitis observed by me in the course of the last few years enabled me to classify them according to the special form of the causal disease.

The classification is the following:

1. Meningitis with uncomplicated, acute, purulent middle ear inflammation.
2. Meningitis with uncomplicated, chronic purulent middle ear inflammation.
3. Meningitis with otitic cerebral abscesses.
4. Meningitis with otitic thrombophlebitis and extradural abscesses.
5. Meningitis with labyrinth suppurations.

In each of these groups, three different types of meningitis

are found to be differentiated: (1) Such types as retain an anatomically visible connection with the ear region, (2) types that do not show such connections, and (3) tubercular forms of meningitis.

Among the circumscribed forms of meningitis, the study of the inflammations of the meninges limited to the side of the diseased ear becomes especially important, since in a great many cases the alterations appear to be limited to the middle or the posterior cranial fossae. Above all, the labyrinthine meningitis belongs to the latter form.

CASE 1. Otitis media suppurativa acuta dextra. Meningitis serosa. Antrotomy, exposure of the middle and posterior skull fossae. Healing. Lumbar puncture showed clear serum; after 24 hours very fine coagulation, considerably increased pressure of outflow.

History: Johann E., of Vienna, 10 years of age, received at the Ear Department of the University of Vienna May 12th, 1907.

Seven years ago otorrhea of the right side, which soon healed. Since then, once or twice a year middle ear inflammation on the right side, finally suppuration for five or six days at the end of January, 1907. Since then, comfortable, good hearing, no secretion.

Two weeks ago the boy had violent pains in all his joints with fever, headache, vomiting and stiff neck. During the night before his reception at the clinic he had fever, delirium, awoke with loud crying from his restless and frequently interrupted sleep. His hearing was reported to be good on either side.

Findings: The left drum membrane was normal. Right drum membrane in posterior-superior quadrant showed a perforation of the size of a hemp seed; moderately moist, but not fetid suppuration. Functional finding of the left side normal. Conversational speech 9 m. on the right side, whispered speech and acumeter 5 m. Weber to the right. Schwabach lengthened; Rinne, on the right, negative; lower limit of tones moderately restricted, the upper one normal, watch heard by bone conduction. No symptoms of a disease of the static labyrinth. The soft tissues over the right mastoid process are moderately thickened, but no pressure pain. Temperature 38.6°, pulse 60. Operation was made by Dr. Alexander in chloroform narcosis. Typical skin incision, exposure and opening of the mas-

toid process. Antrotomy. Bones diffusely softened, however, only a little pus. Exposure of the sinus of the middle and posterior cranial fossae. Deep position of the dura of the middle cranial fossae. Cortex of the skull unchanged. Dura is much stretched, but not changed otherwise.

Lumbar Puncture: Evacuation of about 15 ccm. of clear cerebrospinal fluid under increased pressure, which after twenty-four hours showed very fine string-form coagulation; microscopically scanty mono- and polynuclear leucocytes, no microorganisms and by culture the fluid was sterile.

May 16, 1907. Gradual decrease of fever. Stiffness of neck the same, headache.

May 22, 1907. Change of dressing. Auditory canal dry. Drum membrane closed. Mastoid wound quiet. Lumbar puncture. In the last few days fever up to 38.4°. Patient is apathetic, lying in passive dorsal position, at times unconscious and repeatedly cries out suddenly. Patient passes urine and stools in bed.

May 26. Patient almost totally unconscious for two days, convulsions, pupils wide and not reacting. Pulse 40-60. Patient takes slight quantities of milk by spoonfuls. The ear wound is dressed every other day. Lumbar puncture.

June 5. Temperature now up to normal. Meningeal phenomena unchanged. Somnolence less.

July 10. Gradual decrease of the meningeal symptoms. Patient takes much nourishment. No vomiting. Temperature 36 to 37°.

July 17. Patient leaves his bed at times.

July 20. Patient is dismissed and referred to ambulatory after treatment. Healing of the ear wound without any reaction. Patient took a milk cure, gained considerable in weight, looks rosy, and has no complaint.

In this case, the meningitic phenomena appeared in their severest state simultaneously with the otitis media; that is to say, two weeks previous to the reception at the clinic.

In the above cited case we cannot decide with certainty whether we had to deal with an exacerbation of a chronic middle ear inflammation, or another acute disease. The findings on the drum membrane, the healing with intact drum membrane and good hearing speak for the fact that the last disease was not connected with the former otitis. The history further shows that the middle ear inflammation began with

pains in the joints, accompanied by fever, headache, vomiting, stiffness of the neck, outcries during the night and restless sleep. In operating, the antrum was opened, the sinus and the dura of the middle and posterior cranial fossae exposed. A strict localization of the meningitis in the region of the right ear could not be proved. The dura was pathologically distended. In spite of this, the beginning of the meningitis shows that we had here undoubtedly to do with an otitic meningitis, at least a meningitis plus an otitis, rather than one without an otitis. Since local symptoms in the dura could not be established during the operation, incision of the dura was dispensed with. The lumbar puncture which immediately followed the operation and was later on repeated twice, always showed a clear, sterile, coagulating liquor that escaped under highly increased pressure. The severest meningeal phenomena (delirium, convulsions, drowsiness, complete unconsciousness at times) lasted from May 12th to June 18th. The ear wound during that time was at first dressed daily and then every other day. As regards variations of temperature, the patient was received with fever of 38.6° . After the operation, the fever sank within four days to the normal and two days later again rose; then there was continuous fever for four days, up to 38.5° , when it sank again to the normal and after that time the temperature remained normal. From the clinical standpoint, and with regard to the great intervals of no fever, the case had absolutely the appearance of a meningitis tuberculosa. This, however, is contradicted by the violent meningeal phenomena, their simultaneous appearance with considerable increase of temperature, further by the highly increased pressure of the liquor cerebrospinalis, the findings during the operation and finally the findings of the lumbar puncture. In spite of repeated and exact examination, we did not succeed in finding tubercle bacilli in the liquor obtained by lumbar puncture. Also, the acute course and the favorable issue, the robust physique and considerable increase in weight speak against a tuberculous meningitis, so that the diagnosis must read meningitis serosa acuta.

CASE 2. Otitis media suppurativa acuta dextra. Acute purulent mastoiditis. Antrotomy. Meningitis. Lumbar puncture showed gray-yellow, cloudy, sterile cerebrospinal liquor which escaped under increased pressure. Recovery.

History: Oscar D., of Vienna, 7 years of age, received at

the Ear Department of the University of Vienna on May 26th, 1904, Pr. No. 251, Journal No. 11,733. Patient reports otorrhea for eight days, bad hearing, pain in the right ear. Since a few days, spontaneous and pressure pain in the mastoid process, high fever, no appetite and no sleep.

Status presens: A very restless child with high fever (40°). Even on slightly touching the right mastoid process, patient complains of great pain. The auditory canal in its depth is impassably narrowed. The drum membrane is not visible; fetid secretion. Left ear otoscopically normal. The functional findings of the ear could not be undertaken on account of the youthful age and the severe disease.

May 6, 1904. Operation was made by Hofrat Politzer. Opening of the mastoid process and the antrum. The interior of the mastoid was pneumatic, filled with pus; the bone was softened as far as the sinus, which was exposed to the size of a bean. The bone was not changed towards the antrum, the middle and posterior cranial fossa, which were exposed.

Course: From May 6th to 20th, 1904, that is to say fifteen days, the temperature was $38-40^{\circ}$ and mostly of continuous type. Only on two days (May 8th and 14th) there were remissions to 37° and 36.6° in the evening.

May 27th. Lumbar puncture; 10 ccm. of yellow-gray, very cloudy cerebrospinal liquor is evacuated under increased pressure. After six hours thread-like coagulation (Dr. Bartel). By microscope and culture the liquor is sterile. Mono- and polynuclear leucocytes.

During the first week after the operation stiff neck, convulsions, delirium, repeated vomiting, at times patient is somnolent, lying in passive dorsal position. During all this time patient only takes slight quantities of milk that are given to him with a spoon.

With the loss of fever on May 20th, the complaints became less and the stiffness of the neck disappeared. The patient takes nourishment with appetite and can sit up. Comfortable.

July 18th. The wound is smaller, and we find sluggish granulations in it. In changing the dressing, a sequestrum about 6 mm. long and 2 mm. thick is removed. Drum membrane intact.

August 12th. Increase of temperature in the evening to 38.7° , otherwise constantly normal temperature and comfortable.

September 11th. Since small sequestra have been repeatedly evacuated from the wound, another operation is suggested to the parents of the child.

Operation is quiet; chloroform narcosis. Skin incision in the direction of the old wound. In the bone cavity several small sequestra and one of the size of a hazel nut, sluggish granulations and pus. Removal of the external part of the posterior bony wall of the auditory canal. Wound dressed with iodoform emulsion. Bandage.

September 26th. Patient is dismissed after a curetting of the wound, without any reaction, and referred to ambulatory after treatment. According to an inquiry after three years (May, 1907) the boy is perfectly well and the ear entirely healed.

The present case is in its phenomena completely identical with case 1 of my material. Here also we have to do with an acute purulent middle ear inflammation which led to purulent mastoiditis and caused a meningitis. In operating no proof could be found for the direct connection between the middle ear suppuration and the inflammatory process in the meninges; the bone there being unaltered, the meninges were simply exposed; that is to say, at the middle cranial fossa above the tegmen tympani and antri and above the sinus and the neighboring region of the dura of the posterior cranial fossa.

The meningeal phenomena lasted for two weeks, during which time there was high fever of continual type varying between 38° and 40° , and showing a temporary decrease on two days. May 22nd, patient had no fever, when the meningeal phenomena disappeared and patient felt comfortable during his long stay in the hospital (patient spent his convalescence at the hospital in want of sufficient care at his home; i. e., he remained until September 26th), with one exception, and this most likely in consequence of a local retention. June 10th, fever of 38.7° suddenly appeared. Finally, it is worth noticing that the acute trouble in the mastoid process was caused by a chronic purulent otitis. Repeatedly, small sequestra were evacuated and another operation had to be made on September 11th, removing the diseased bone. Prompt healing followed and since then patient has been comfortable. In this case also, taking into consideration the high fever and the violent phenomena, the diagnosis is meningitis serosa. Finally, the findings of the fundus oculi (marked by consider-

able distended veins) are not without importance for the diagnosis of meningitis. Of special interest remains the finding of the lumbar puncture: Yellow-gray, intensely clouded coagulating liquor, evacuated under increased pressure, in which were found by the microscope mono- and polynuclear leucocytes, no microorganisms.

In both cases (1 and 2) long subsequent observations allow us to state that the meningitis was completely relieved and permanently cured. In both cases we cannot take the meningitis serosa to be a secondary complication of the otitis media. On the contrary, it seems that here from the very beginning, the meninges and the middle ear had been simultaneously attacked by an inflammatory disease, so that we are having here no meningitis serosa from an otitis, but with an otitis. Both patients made good recovery, especially the one operated May, 1907, who gained remarkably in weight and had a rosy appearance.

Certain forms of serous meningitis are, however, by no means rare, especially in children, as a preliminary stage of a tuberculous meningitis, which may not appear for weeks or months after the first attack. I report here, out of my observations at our clinic in the years 1900 and 1901, three characteristic cases belonging to this class, which may be called really tragic. They were children at the age of 4 to 6 with typical acute purulent middle ear inflammation. All three of them were treated by ear specialists from the very beginning of the disease. The acute inflammatory symptoms in the middle ear disappeared, yet there was no decrease in the suppuration; it did not become fetid, though a copious, creamy or more or less watery pus continued to discharge. On the mastoid process were at times periostitic thickenings which rapidly disappeared with the application of "Burow's solution" and rest in bed, but suddenly meningitis, with high, increasing fever and stormy symptoms, developed.

Antrotomy: Bones over the dura unaltered, tension of the dura not markedly increased. Lumbar puncture showed clear liquor under increased pressure, which, after twenty-four hours, did not coagulate. After eight to ten days with gradual decrease of fever, complete disappearance of the meningeal symptoms. The patients were dismissed feeling comfortable. The one case, however, was received again three weeks, the other five weeks and the third nine weeks after dismissal

with typical phenomena of meningitis tuberculosa and characteristic lumbar puncture findings (clear liquor, after twenty-four hours, finest coagulations; microscopic, tubercle bacilli). All of these three cases ended with death.

We can certainly not decide exactly whether we did not have from the very beginning a tuberculous otitis and a tuberculous meningitis. The clinical symptoms rather contradict this. In all three cases the otitis appeared with most intense pain and fever. Tuberculous middle ear suppuration has an insidious beginning and frequently the otorrhea will appear without attracting attention, so that later on patient can give only inexact report as to the beginning of the disease. It is very likely that the local inflammatory focus in the ear and in the meninges was from the very beginning not of a tuberculous nature, but yet offered the basis and premises for the appearance of the tuberculous disease that followed later.

The question arises whether a differentiation of such meningeal processes is possible? Such differentiation would perhaps be possible by an exact measurement of the intradural pressure. This pressure is unchanged with meningitis serosa as a preliminary stage of a tuberculous meningitis, whereas it is always considerably increased in the non-tubercular meningitis serosa. In these cases it would be necessary in making the lumbar puncture to measure the pressure under which the cerebrospinal liquor is evacuated; this is best done by means of one of the usual manometers, as, for instance, Sahli's. The pressure in the meningitis serosa which is only a preliminary stage of a tuberculous meningitis will be found to be normal or not essentially increased.

The two cases reported above are of importance also insofar as they show that the findings by lumbar puncture can be different in cases of meningitis serosa with clinical phenomena of similar intensity and duration. In the one case the liquor was clear, while in the other it was yellowish gray and very cloudy.

Serous meningitis as a preliminary stage of diffuse purulent meningitis is surely more frequent than we would expect, judging from the observations and the proofs we have obtained till now. If in such cases the lumbar puncture is made early enough, we will at first have a clear, sterile liquor evacuated with increased pressure and very fine coagulations after twenty-four hours, whereas if the lumbar puncture is made

later it will show an infected cerebrospinal liquor. In this respect we shall report a remarkable case, as follows:

CASE 3. George F., 21 years old, of Triest.

Diagnosis: Meningitis purulenta, following otit. med. supp., etc.

Treatment: Radical operation, opening the labyrinth, repeated lumbar puncture.

History: Five years ago patient had scarlet fever and immediately afterwards suppuration of the right middle ear, which was operated on three months later. Since then, patient was well until April, 1906, when he had otorrhea, and after nine days was again operated; however, the otorrhea did not stop.

Therefore patient came to Vienna in July and a curettement was made. At the latter date pains in the right side of head. Otorrhea not diminished.

Left side: Spur on nasal septum. Pharyngitis chronica.

Left ear: Tympanic membrane lightly retracted.

Right ear: Retroauricular fistula leading towards the tegmen antri and a semicircular cicatrix. Auditory canal filled with thread-fibred pus and narrowed by the projecting anterior lower wall as well as by the slight sinking of the posterior upper wall. The remainder of the tympanic membrane, so far as visible, reddened and atrophied.

Right	Left
A. C	Conversational speech8 m.
O	Whisper3-4 m.
.	Weber
.	Schwabach shortened
—	*Rinne
—	C ₁
—	C ₂
O	Watch

Horizontal spontaneous nystagmus to the sound side.

September 7, 1906. Operation under Billroth's mixture narcosis. Retroauricular curved incision into the old cicatrix. Dissection of the fast adherent periosteum, excision of the fistula. After a few strokes with the chisel the sinus was exposed, with severe hemorrhage from the emissarium; after stopping this the radical operation was completed. Hard and

*Rinne right—Air-conduction almost disappeared and bone conduction much shortened.

vascular bone, granulations in the tympanic cavity. Plastic according to Panse. The wound was left open, bandage.

September 8. During the night vomiting several times, vertigo, strong rotatory nystagmus to the left on looking to the sound side. Temperature 38.6°.

September 9. Vertigo diminished, no vomiting. Rotatory nystagmus to the left on looking to the left.

September 9. The loud, subjective noises have become less. Long-stroked horizontal nystagmus on looking to the left, decreasing in intensity and amplitude as the object fixed approaches the middle line. The sensation of vertigo does not accord with the amount and intensity of the nystagmus. Whereas the patient complained one day about vertigo in looking towards any direction, without any appreciable relation between the amount and intensity of the nystagmus, the next day he complains of the apparent movement of objects to be the factors annoying him most. However, the patient has at times sensations of vertigo, increasing in intensity when altering his position. Patient in looking to the left sees parallel, crossed, double images of unequal size, and which he projects correctly. Whereas patient up to September 8th could lie only on the sound side, in which position he claimed to have the least vertigo, he is to-day able to assume any position without vertigo. Only when lying on the diseased side or while changing position, is the patient aware of the sensation of intense vertigo.

September 10. Horizontal nystagmus on looking to the left. Sensation of vertigo continues. Patient lies on the sound side. In sitting up the nystagmus is unaltered. With feet together and eyes closed, staggering is only perceptible. In bending the head to the diseased side, patient falls back and to the right. On closing the eyes, the staggering and falling is not increased. Standing on one foot is almost impossible, whereas he can stand tip-toes, with open and closed eyes, though awkwardly and staggering. Hopping with both feet is accompanied by slight staggering. Patient was a good gymnast. All motions are well made, though accompanied by staggering. Diplopia continues. Change of dressing.

September 11. Nystagmus, on looking to either side, stronger to the left. Sensation of vertigo somewhat diminished. Numbness, light hyperesthesia. General condition bad. Temperature 37.4°, pulse 80, sufficiently strong.

On changing the dressing, we find muco-purulent secretion.

Hearing distance about $\frac{1}{2}$ m. for conversational speech, Weber to the right.

Lumbar puncture reveals yellowish cloudy liquor, evacuated under moderate pressure (about 10 ccm.). By microscopic examination of same we find it rich in leucocytes that give positive iodine reaction.

Operation under Billroth's mixture narcosis. Chiselling off the posterior wall of the pyramid with removal of the posterior and horizontal semicircular canals and opening the promontory, penetrating as far as the interior auditory canal. The membrane labyrinth appeared hyperemic. The dura of the posterior cranial fossa was incised in the form of a right angle, whereupon the cerebellum projected. Tamponading. Dressing. Facial paralysis. After operation short-stroked nystagmus to both sides, frequent vomiting and somewhat benumbed. In the evening 1 cgr. morphin.

September 12. Two o'clock at night, entirely conscious, relatively good subjective symptoms, no vertigo, no nystagmus. In the forenoon two lumbar punctures with withdrawal of about 6 ccm. of very cloudy purulent liquor. Highest temperature 39.2° . Pulse moderately accelerated, strong; in the evening 1 cgr. morphin.

September 13. Very restless, sleepless night, continuous vomiting, 8 a. m. temperature 38.2° , pulse 102. Short-stroked nystagmus to both sides, some headache and tenderness of the neck. Very much coated tongue. Vomiting diminished. No diplopia.

September 14. Slept quietly half of the night. Morning temperature 38.7° , pulse 72, strong. Mind clear, vomiting less, mobility of the head restricted. Lumbar puncture; withdrawal of 10 ccm. of less cloudy liquor; however, under great pressure. Tongue very much coated; 8 p. m. temperature 38° .

September 15. Sleepless, restless night, in spite of morphin injection; temperature at 8 a. m. 38.4° , pulse 90. Patient often shrieks out, neck very stiff, comatose. Distinct Trousseau phenomenon. Nutrient enema. Subcutaneous injection of 20 ccm. Marmorek serum. In the evening 1 cgr. morphin. Temperature 38.2° . No nystagmus any more.

September 16. Sleepless night, continuous delirium, temperature 38° 8 a. m. Dry coated tongue, weak, irregular pulse, incontinence of urine and feces. Change of dressing. Widening of the incision into the dura.

September 17. Condition unaltered. Temperature 36.6° at 8 o'clock a. m. In the evening comatose condition.

September 18. 6 a. m., death.

Post mortem result: Purulent internal pachymeningitis and leptomeningitis at the base of the brain, especially within the region of the chiasma, the pons, the under surfaces of both cerebellar hemispheres and the medulla. Fibrino-purulent inflammation of the inner meninges of the spinal cord.

Flattening of the brain convolutions on the surface. Radical operation of the right ear after chronic otitis, with incision of the dura and puncture of the right cerebellar hemisphere. Acute edema of both lungs, enlargement of the kidneys and the heart.

Double vision, stiff neck and convulsions were in this case the first symptoms of a meningitis that had been a complication of and was most likely caused by a purulent labyrinthitis. The lumbar puncture at the very beginning and one four days later showed a yellow, purulent, cloudy liquor evacuated under moderately increased pressure. The liquor coagulated after twenty-four hours; microscopic, leucocytes with positive iodine reaction, no microorganisms, sterile by culture. A later lumbar puncture showed a streptococci-containing liquor. We have here the type of a meningitis to be considered as a stage between a meningitis serosa and an acute purulent streptococci meningitis. Such meningitis is by no means rare; however, only very difficult to diagnose, because the lumbar puncture for the most part is done after the stage of the purely serous character of the meningitis; that is to say, in the stage of purulent meningitis. In operating, brain tissue immediately protruded into the incision of the dura, a sure sign of encephalitis. An inflammatory swelling of the surfaces of the brain also in this case preceded the infectious purulent meningitis.

Moreover, superficial encephalitis seems to represent a typical accompanying phenomena of acute serous meningitis, and I can, according to the material examined by me, fully confirm the opinions of Bönninghaus and others on meningo-encephalitis.

I shall now report two cases of acute meningitis induced by labyrinth suppuration, which recovered:

CASE 4. First reception. Karl H., 30 years old, bricklayer, of Oberkirchen, Austria, received January 28, 1906.

Diagnosis: Otitis media suppurativa chronica dextra. Cho-

lesteatoma. Labyrinth suppuration. Meningitis ex otitide. Fistula of the semicircular canal.

Therapeutics: Radical operation. Plastic after Panse. (Removal of the lateral and posterior semicircular canals, opening of the upper one as far as the vestibulum.)

History: Patient has been deaf in the right ear since a child. Sometimes otorrhea, the present attack lasting one year and a half. Since eight days severe pain within the entire region of the ear. Three weeks ago patient had violent vertigo for six to eight days. Patient also frequently vomited. To-night nausea, vomiting, severe pain so that patient could not sleep.

Left ear: Clouded retracted tympanic membrane.

Right ear: Slit shaped auditory canal on account of sinking of the posterior upper wall; fetid, abundant secretion.

Right	Left
9 m	Speech 5 m.
6 m	Whisper at ear
Weber to the left.	
—	Rinne { Bone conduction slightly shortened, air conduction very much shortened
+	C ₁
+	C ₄
+	A

January 29, 1906. Radical operation in quiet inhalation narcosis. Exposure and opening of the mastoid process, sinus moderately forward and exposed to the size of a lentil. Tympanic cavity and antrum filled with finely stratified cholesteatoma reaching as far as the sinus. On the lateral semicircular canal a fistula 5 mm. in length and corresponding to the diameter of the semicircular canal, discolored contents of the semicircular canals. Removal of the lateral and posterior semicircular canals, as well as opening of the upper one as far as the vestibulum, which was filled with disintegrated, discolored masses (cholesteatoma) that were removed with the sharp curette. Plastic according to Panse. Wound dressing. Bandage.

February 5. Second change of dressing. Wound granulating well.

February 7. Change of dressing. Fetid secretion from the bottom of wound. No vertigo. No vomiting. Head aches on the operated side.

February 9. Patient has pains in the right iliocecal region. Retention of urine. Increase of temperature.

February 10. Patient is transferred to room 54 of Hochenegg's clinic for operation.

February 15. Laparotomy in Hochenegg's clinic February 10th on account of acute appendicitis. Since February 14th violent headaches, and to-day vomiting so that the patient is again referred to our clinic.

Patient very feeble, sense of localization destroyed, complains of severe, right-sided frontal headaches. Medium rigidity of the neck, and active motions of the head and the cervical portion of the vertebral column are carefully avoided. Moderate fetid pus secretion from the wound cavity. No disturbance of coordination. Long-stroked nystagmus more frequent to the sound side than to both sides.

Operation under quiet Billroth's mixture narcosis. Enlargement of the skin incision of the first operation, at the end of which two incisions are made about 3 cm. long, running horizontally backwards. Elevation and retraction of posterior flaps thus formed. Exposure of the operative cavity. Wide exposure of the dura of the middle cranial fossa and enlargement of the opening in the dura of the posterior cranial fossa, with removal of the basal part of the petrous portion of the temporal bone. Under considerable pressure, extradural pus wells up from below. Dura of the middle and posterior cranial fossa diffusely reddened and strongly injected. The exploration of the posterior cranial fossa negative; that of the middle cranial fossa shows the following: Brain surface diffusely reddened, moderately edematous.

By lumbar puncture about 10 ccm. of purulent, cloudy, light yellow colored cerebrospinal liquor is evacuated under considerably diminished pressure. Wound dressing. Bandage.

February 16. Patient complains of severe headaches, gets morphin subcutaneously. Restless during night. No vomiting. Slight facial paralysis.

February 19. Patient complains of headaches. Quiet during night. Pulse and temperature normal.

February 21. Very restless night. Most severe headaches.

Ice bag and morphin injection. During day patient is somnolent and lies in opisthotonus, so that the entire body is lifted by the support of the neck.

February 22. Complaints diminished, temperature normal. Patient is lying in quiet dorsal position.

February 23. Patient complains of headaches. Restless night.

February 24. Temperature normal since yesterday. Relatively comfortable with the exception of headaches.

February 26. Fairly comfortable. Headaches less.

March 1. Change of dressing, comparatively comfortable.

March 2. Temperature 39.7°. Sore throat. Aspirin 1.0. Gargle.

March 3. Change of dressing. Relatively comfortable.

March 5. Localized headaches.

March 8. Change of dressing. Comfortable, walks about.

March 11. Patient complains of headaches.

March 13. Patient complains of severe headaches near the right temporal bone.

March 14. Patient complains of the same pains as yesterday.

March 16. Status idem. The wound looks very good.

March 20. Relatively comfortable. Patient has galvanism daily.

March 30. Comfortable. Secondary suture.

April 13. One sequestrum has been evacuated.

May 4. Relatively comfortable. Patient is dismissed and referred to ambulatory after treatment.

Second reception: After May 4, 1906, patient came daily for ambulatory treatment. Otorrhea did not stop. Headaches are still prevailing, though less. Vertigo only on stooping. For two weeks patient complains of an acute pain in his legs as far as the knee.

June 13. A sequestrum came from the ear.

June 19. Two fusiform sequestra 7 mm. long and $\frac{3}{4}$ mm. in diameter were removed from the ear.

June 25. Condition the same. Patient complains of headaches on the other side. Secretion moderate. In the left side of the nose the posterior end of the lower turbinate and the anterior end of the middle turbinate very much hypertrophied. Operated.

July 5. Patient is dismissed in good condition. Subsequently complete cure.

In this case we have a purulent labyrinthitis with purulent ostitis of the petrous portion of the temporal bone itself in the course of a chronic middle ear suppuration. We cannot establish with certainty how long the labyrinth suppuration existed before patient was received. It is true, it is stated that there was deafness since childhood; however, we know that in chronic middle ear suppuration deafness may occur without the suppurative process involving the cochlea (Kuemmel). In such cases deafness may also have been caused by simple degenerative changes of the nervus acusticus and its ganglions or by atrophy of Corti's organ. Therefore, in our case, the vestibular symptoms are of greater importance. We learn that three weeks before the patient was received he had violent attacks of vertigo, and it is very likely that these indicate the beginning of the labyrinth suppuration.

When operating in the latter part of January a middle ear and labyrinth cholesteatoma was found. After the operation, which consisted in the radical operation, the wide opening of the labyrinth and the exposure of the cranial fossae, vertigo stopped immediately; however, two bad symptoms remained. The wound secretion remained fetid and purulent and the patient complained of continuous headaches, especially on the operated side. These phenomena were suddenly complicated by ileocecal pains. The examination revealed an acute appendicitis, and the patient was referred to the second surgical clinic of Professor Hochenegg and operated February 10th. During the course of an uneventful laparotomy convalescence, sudden symptoms of a severe meningeal disease appeared. High fever, coma and vomiting occurred. The examination immediately on the retransference of the patient to the ear clinic revealed the following: Patient is very weak, at times loss of consciousness, complains of severe right sided frontal headaches, stiff neck, active movements of the head and neck are carefully avoided. No ataxia can be elicited. No disturbance of coordination. Long-stroked nystagmus, more so to the sound side than to diseased side.

The unchanged fetid secretion indicated a deep seated purulent focus, and in the operation an extensive extradural abscess over the petrosal roof was exposed and evacuated. The dura of the middle cranial fossa was strongly injected, not changed in the posterior cranial fossa. The incision of the cranial fossae revealed in the region of the middle cranial

fossa a diffuse reddening of the leptomeninges, swelling of the temporal lobe, no changes in the cerebellum.

In making the lumbar puncture yellow, cloudy liquor was evacuated under diminished pressure. The violent meningeal phenomena continued for a while, and five days after the operation there was somnolence, strong opisthotonus, and stiff neck. On the eleventh day after the operation, patient first felt tolerably well and the severe headaches also stopped. Three weeks later patient left his bed. During the after treatment small sequestra were repeatedly discharged from the upper petrous portion of the temporal bone. This sequestration undoubtedly caused the chronic headaches, and was also the reason why on the 16th of June the patient had to be taken in again.

June 19. Two fusiform sequestra, 7 mm. long and $\frac{3}{4}$ mm. thick, were extracted, when all symptoms ceased. Thorough chiselling produced complete healing and patient is perfectly well and able to work.

We have here a case of severe meningitis which, according to its character, has to be classed between the serous and the purulent meningitis. It is distinguished from the serous meningitis by the color of the cerebrospinal secretions (the cerebrospinal liquor was purulent and cloudy) and from the purulent meningitis by the lack of micro-organisms. The infection of the meninges resulted from the labyrinth cholesteatoma, which led to purulent otitis of the petrous bone. It was remarkable that, according to the findings at the operation, the meningitis chiefly involved the middle cranial fossa of the diseased side, and we only learned from the later clinical symptoms the extension of the meningitis to the posterior cranial fossa (strong opisthotonus and stiff neck). The evacuation by the lumbar puncture of the cerebrospinal fluid under diminished pressure might be referred to the fact that before the lumbar puncture the dura of both cranial fossae was incised. Possibly also those causes will have to be taken into consideration to which Frey, Hinsburg, Körner, and Schwartze ascribe the diminished evacuation pressure of the cerebrospinal fluid; viz., meningeal agglutinations at the foramen Magendii or a thick viscid meningitic exudate.

The therapeutics consisted in the removal of the extradural abscess and in the opening and drainage of both cranial fossae. The lumbar puncture was made only once, the incision

of the dura was in this case indicated not only by the meningeal symptoms, that clearly pointed to meningitis of the diseased side, especially of the middle cranial fossa, but also by the finding at the operation that likewise indicated a close anatomic relation of the meningitis with the changes in the ear region. There is no doubt that localized meningeal processes are best controlled by a wide opening of the dura. Especially is it indicated in encephalitis (Körner, Manasse), which is manifested by the protrusion of the superficial brain tissue into the incision. We obtain hereby a diminution of the intradural pressure and a reliable drainage. It is only necessary to expose well the region of the necrosed bone and dura and remove thoroughly the diseased portions of the bone. Unfortunately a brain prolapse cannot be avoided.

To this group of circumscribed meningo-encephalitis belong, amongst others, circumscribed meningitis with great swelling of the cerebellar hemisphere of the posterior cranial fossa in the region of the sinus sigmoideus, in cases of infectious thrombophlebitis. With timely and thorough surgical treatment circumscribed meningitis with infectious thrombophlebitis has a rather good prognosis. For illustrating this kind of a disease I may refer to the following case:

CASE 5. Josef C., 19 years old, joiner, of Vienna, received at the Ear Department of the University of Vienna June 30, 1907.

Diagnosis: Otitis media suppur. chronica sinistra, cholesteatoma, extradural abscess of the middle and posterior cranial fossae, thrombophlebitis of the sinus lateralis.

Therapy: Jugular ligature. Radical operation after the removal of the cholesteatoma and thrombus from the sinus lateralis to the bulbus jugularis, opening of the extradural abscess, lumbar puncture.

History: Since his tenth year, suppuration of the left middle ear. Patient's ear was never treated. Three weeks ago patient fell ill with fever, headache and chill and was brought to the clinic since his trouble continued.

Present condition: Strong, well nourished individual, passive dorsal position, active and passive motions of the head and neck considerably restricted. Cutaneous sensibility unaltered, mobility and coordination normal.

Aural findings: Left tympanic membrane destroyed, thin crumbly pus in the auditory canal; by the microscope are

found many cholestearin crystals, secretion exceedingly fetid. Right tympanic membrane much retracted, clouded.

FUNCTIONAL FINDINGS.

Right		Left
14 m	Speech	1 m.
6 m	Whisper	O.
6 m	Acumeter	O.
—	Weber	+
—	Rinne	—
Shortened	C ₁	Somewhat shortened
Shortened	C ₂	Shortened
—	Watch	+
—	Acumeter	+
None	Spontaneous nystagmus	} Slow, long stroked, horizontal

With an ear tube conversational and whispered speech are heard on the left side normally.

Fundus oculi unchanged, no morbid phenomena on the part of the other cerebral nerves, no motor aphasia or dysphasia; patient had a chill (41.2°) during night, pulse 108, respiration 24; complains of severe headaches that are localized over the region of the mastoid process and the planum temporale, diffuse swelling of the soft tissues over the mastoid with considerable spontaneous and pressure pain over same and on the throat.

No changes to be found in the abdominal and thoracic viscerae, no pain whatever, nor swelling of the extremities.

July 1, 1907. Operation under Billroth's mixture narcosis. Exposure and ligation of the vena jugularis intern. sinistr. in the middle third of the throat; the moderately filled vein contains fluid blood and is divided through between double ligatures, retroauricular skin incision, 7 cm. long, from both ends of which two parallel skin incisions are made backwards 7 cm.; in separating the posterior cutaneous wall of the auditory canal intensely fetid pus, mixed with cholesteatoma, wells forward under considerable pressure; after opening the mastoid process for a short distance, ichorous cholesteatoma masses push forward from the region of the middle cranial fossa under pulsations; radical operation, cleansing the tympanic cavity filled with polypi and cholesteatoma. Cured the tube; the temporal bone is much necrosed near the middle and pos-

terior cranial fossae, the dura is exposed over the tegmen tympani et antri and over the sinuses the size of a bean. The bone is softened and fetid at the seat of necrosis; lateral sinus wall greyish green, discolored and brittle. The posterior and middle cranial fossae are exposed from the sinus for an area as large as a dollar; exposure of the sinus to and over the knee as much as 4 cm.; downward removal of the tip of mastoid, exposure of the bulbus, splitting and removal of the lateral sinus wall. The sinus is thrombosed corresponding to the entire extent of the pachymeninges; the thrombus is softened in the bulb, and in the lower part, a dark red thrombus reaches far down. After the removal of the thrombi a hemorrhage came from both sides; dressing, fixation of the square cutaneous flaps to the front by means of a suture.

July 2. First change of dressing. Sewing of the peripheral vein ends with two double sutures (jugular cutaneous fistula); change of the bulb drain, ichorous secretion; removal of the strip at the lower end of the sinus, incision of the dura of the posterior cranial fossa $\frac{1}{2}$ cm. to the inner sinus wall; the cerebellum prolapsed some millimeters through the opening, brain surface reddened, evacuation of some drops of cloudy liquor. The lumbar puncture gave a grey cloudy liquor (10 ccm., evacuation pressure unaltered, microscopically many polynuclear leucocytes, no microorganisms).

July 3. Second change of dressing.

Opening of the peripheric vein ends, from which hemorrhagic secretion escapes. The peripheric ends of the vein are kept open by introducing iodoform strips with change of dressing at the bulb.

July 4. Third change of dressing.

Superficial shortening of all strips, change of dressing at bulb and the jugular.

July 5. Fourth change of dressing; much secretion through the peripheric vein end; removal of the drain from the tympanic cavity.

July 6. Fifth change of dressing; fetid secretion in the region of the bulb. H_2O_2 is applied, damp iodoform gauze.

July 7. Change of dressing. Secretion from the peripheric jugular end.

July 8. Change of dressing. Secretion from the peripheric jugular end.

July 9. Change of dressing.

July 11. Patient is comfortable, wound over the jugular free from secretion and granulating. Ichorous pus in the upper part of the wound over the mastoid process.

July 12. Status idem.

July 13. Change of dressing.

July 14. In the upper part the wound seems much inclined to close. Near the sinus still ichorous secretion.

July 16. Change of dressing.

July 17. Change of dressing. Ichorous suppuration.

July 18. Change of dressing. Ichorous suppuration.

July 19. Change of dressing. Ichor near the sinus.

July 20. Status idem.

July 22. Change of dressing. Secretion diminished and less fetid. Granulations arise over the entire surface of the wound.

July 23. Change of dressing.

July 24. Change of dressing. There is no more secretion from the wound of the neck.

July 25. Change of dressing.

July 26. Change of dressing. Unchanged.

July 27. Change of dressing. Unchanged.

July 28. Change of dressing.

July 29. Change of dressing.

July 31. Patient complains of severe vertigo. Rotatory nystagmus to both sides.

August 1. Change of dressing. Secretion scant and not fetid. Rotatory nystagmus less than yesterday, no vertigo.

August 3. Change of dressing. Slight and non-fetid secretion. Rotatory nystagmus to both sides, no vertigo.

August 5. Status as yesterday.

August 7. Plastic.

August 9. Change of dressing.

August 11. Change of dressing. Patient is dismissed and referred to ambulatory after treatment.

August 15. Change of dressing. Brain much prolapsed. Patient has strong nystagmus to both sides. Distinct disturbances of equilibrium, and incoordination on the left side. Left ear deaf.

August 19. After ten turns to the left on the revolving chair rotatory nystagmus to the right, with view straight ahead, for ten seconds. After ten turns to the right rotatory nystagmus to the left, with view straight ahead, for ten seconds.

August 29. Spontaneous nystagmus to both sides; however, more to the right. Upon the revolving chair, after ten turns to the right, no nystagmus to the left with view straight ahead. After ten turns to the left, horizontal nystagmus to the right, with view straight ahead, for twenty seconds. Brain more prolapsed than a week ago.

September 14. Spontaneous, long-stroked, horizontal nystagmus to both sides. After ten turns to the left with head straight, horizontal nystagmus to the right, with view straight ahead, for twelve seconds. After ten turns to the right no nystagmus with view straight ahead.

September 18. Horizontal nystagmus to both sides, strong to the right; however, less than before. On revolving chair: After ten turns to the left, head straight, horizontal nystagmus to right, thirteen seconds. After ten turns to the right, head straight, horizontal nystagmus to left, six seconds. After ten turns to the left, head bent forward, rotatory nystagmus to right, eleven seconds. After ten turns to the right, head bent forward, rotatory nystagmus to left, five seconds.

With the ear tube conversational speech is heard without any mistakes; whispered speech with mistakes.

October 8. The left labyrinth does not react and loud conversational speech is not heard with the ear tube. Further course without any reaction.

The above reported case might be followed by a whole series of analogous observations. We have here to deal with cases of infectious sinus thrombosis with meningeal symptoms. The sinus thrombosis is operated according to the nature of the sinus occlusion, and either immediately after the operation or twenty-four hours later the posterior cranial fossa is opened on the same level as the sinus or in its immediate neighborhood by an incision of the dura. The cerebellum protrudes. On account of the daily change of dressing, the meningeal phenomena will gradually disappear. The lumbar puncture in all of these cases shows a more or less purulent, cloudy, sterile liquor. The meningeal phenomena originate in these cases from the inflammatory change in the sinus wall itself and consist in pachymeningitis externa and interna leading to leptomeningitis and encephalitis. If the incision of the dura is dispensed with or made too late, there is the greatest danger that the circumscribed meningitis, in which, according to the findings of the lumbar puncture, the intradural space is still

free of bacteria, will become infected and give rise to a diffuse infectious purulent meningitis. In making the autopsy, we are by no means often able to prove the direct relation between purulent meningitis and sinus thrombosis; sometimes, however, with a diffusely spread purulent meningitis the cerebellar pole especially will appear swollen on the diseased side and covered with much purulent secretion. In two cases a distinct impression of the medial sinus wall on the cerebellar hemisphere could be demonstrated, an indication of great swelling and infiltration of the brain. MacEwen describes and demonstrates an exactly similar case. Spontaneous healing of circumscribed meningitis with sinus thrombosis, without incision of the dura, is certainly rare; at least, it can be seldom proved. In this connection, the report of the following case might not be without interest:

CASE 6. Josef S., 37 years old, of Vienna, received at the Ear Department April 8, 1906.

Diagnosis: Otitis media suppur. chronica. Sinus thrombosis. Pachymeningitis purulenta externa chronica.

Therapy: Jugular excision, radical operation, exposure of the dura. Plastic according to Panse.

History: Patient for eleven years has had suppuration from both ears, with diminished hearing, and was treated for that. A week ago he got headaches and fever. The day before yesterday and yesterday he had chills and vertigo; however, no vomiting.

Left ear: Large perforation in the posterior lower quadrant, little secretion.

Right ear: Auditory canal narrowed and filled with fetid pus. Granulations.

Right mastoid process warmer than the left one. Great sensibility to pressure on the same and the occiput.

Right	Left
4 m	Conversational speech8-10 m.
1 m	Whisper5 m.
1 m	Acumeter5 m.
	Schwabach shortened
	Rinne negative
Much shortened . . . C ₁	+
Much shortened . . . C ₄	+
+	Watch
	+

No spontaneous nystagmus; nystagmus after turning, caloric and galvanic all normal; no disturbances of equilibrium.

April 8. Operation under Billroth's mixture narcosis. The right jugular is exposed and ligated in the usual way. The jugular contains liquid blood. Radical operation. The mastoid process is slightly sclerosed. Near the sinus the bone is softened and filled with fetid cholesteatoma masses towards the antrum. Plastic according to Panse. Exposure of the middle and posterior cranial fossa and the sinus transversus. The lateral sinus wall is greyish yellow. Extensive purulent pachymeningitis externa. Exposure of the sinus to the region of healthy tissues. After incising the dura, we find strong leptomeningitic adhesions. Opening of the sinus transversus. There is a peripheral thrombosis. Wound dressing. Bandage.

April 9. Patient did not vomit, fairly comfortable.

April 10. Patient has no subjective phenomena and takes some liquid nourishment. Examination of the secretion by the Pathological-Anatomical Institute (April 11, 1906): Streptococci in pure culture.

April 16. Secondary suture.

April 19. Comparatively comfortable.

April 25. Relatively slight secretion.

April 26. Relatively comfortable. Daily change of dressing.

May 1. Status idem.

May 7. Status idem.

May 10. Jugular wound healed.

May 11. Patient is dismissed on account of want of room and referred to ambulatory after treatment.

Since then completely healed.

At the time of the operation of the thrombophlebitis, the meningitis had led to a circumscribed adhesion of the pachy- and leptomeninges. Here also the close topographic relation is again observed that exists between the intradural change and those plaques belonging to pachymeningitis externa. Intradural agglutinations may, however, as often represent the beginning as well as the end of a meningitis. In our case they characterized the beginning of the meningitis. Patient never before had shown clinical symptoms of a meningitis. An early incision prevented the intradural infection and the purulent meningitis.

It is striking that with otitic sinus phlebitis, circumscribed meningitis is so frequently found. This may depend upon the fact that the sinus phlebitis is almost always connected with

a pachymeningitis externa and not seldom with a pachymeningitis interna.*

From the pachymeninges the inflammatory process may easily progress towards the brain, and especially the pachymeningitis interna involves the danger of a meningo-encephalitis.

Meningitic changes are typically established in case of otitic brain abscess. They seem more frequently to correspond with a diffuse meningeal disease and only seldom show a localization to the diseased side. I may here demonstrate a remarkable observation:

CASE 7. George R. became ill with the symptoms of meningitis and was admitted with that diagnosis into the medical clinic. The examination of the ear revealed a chronic middle ear suppuration. The radical operation was done and, after the removal of the cholesteatoma and the diseased bone, both cranial fossae were exposed. The lumbar puncture which was made immediately showed a clear liquor evacuated under increased pressure. After twenty-four hours, slight coagulation; microscopic, single polynuclear leucocytes, no microorganisms. The symptoms of the disease disappeared and the patient, who was received October 14, 1904, was dismissed December 19, 1904, in perfect health.

Patient was again admitted on January 27, 1905. After his discharge from the hospital, he had felt well, had no headache, no vertigo, slept well and enjoyed good appetite. The wound looked good, little secretion and every other day change of dressing.

January 5. Secondary suture was made. Three days later the sutures had to be removed on account of acute copious and fetid secretion. With it appeared loss of appetite, headaches; however, no vomiting. Patient complained of being very tired and worn out. Change of dressing every day. Suppuration became somewhat less.

There was always slight diplopia, which was very changeable, almost disappearing in the morning, whereas it became more intense toward the evening. In looking upwards, it disappeared and increased the more the patient bent his head downward.

January 27. Sudden headache all over the forehead, especially when patient sat up, nausea and violent, repeated vom-

*Alexander Monatschrift f. Ohrenheilk.

iting during the day. On this account, patient was admitted to hospital.

January 29. Operated under Billroth's mixture narcosis. Lumbar puncture: Purulent cloudy liquor under increased pressure. With the microscope, many polynuclear leucocytes were found, but no microorganisms. Thick coagulum. Exposure of the field of operation was made over the middle and posterior cranial fossae and the sinus transversus by enlarging the opening from the sinus lateralis posteriorly. The sinus transversus was situated remarkably deep; the dura was moderately injected and considerably bulged forward. After the incision, about 100 ccm. of fetid pus was evacuated under high pressure from an abscess in the temporal lobe. A strip of iodoform gauze was put into the abscess cavity, wound dressing and bandage.

January 30. Right facial paralysis, diplopia disappeared.

February 1. Result of ophthalmoscopic examination: Papillae not sharp, somewhat striped on the periphery; the veins are somewhat dilated and tortuous, slight neuritis.

February 3. Change of dressing. Secretion from abscess cavity moderate.

February 5. General condition good, uneventful course. No diplopia. Patient walks about.

February 11. Morning temperature a little above the ordinary (37.2°). No headache, no vertigo, no spontaneous nystagmus.

February 15. Patient is referred to ambulatory after treatment, as the wound looks good and his health in general is also good.

On January 27, 1905, patient was received with the symptoms of an abscess of the temporal lobe and by operation the abscess was evacuated, followed by healing. The original meningeal disease of the patient corresponded to the initial stage of a brain abscess, which has thus been complicated by a meningitis serosa. The meningitis decreased; the abscess entered into the latent stage and became manifest about January 27th. We have repeatedly referred to the importance of finding a cloudy sterile liquor evacuated under increased pressure. (Brieger, Körner, Leutert, Wolff, Alexander.) It might be taken as a characteristic feature of otitic brain abscess. However, cloudy fluid frequently seems to occur only in the manifest stage of brain abscess or immediately before its rupture.*

*In case 11, the puncture made two and one-half weeks before death was still clear.

and meningo-encephalitic changes with otitic brain abscesses have not until now been observed at such an early stage as in this case.

Until the last few years, this exceedingly important character of the cerebrospinal liquid was unknown. Without going into the question of microorganisms, the purulent cloudy liquor was regarded as a sign of purulent meningitis and a contraindication to an operation for the reason of not promising any success. The autopsy revealed a brain abscess! With a timely diagnosis, the patient might have been saved. This point of view, which indeed has never been ours, has been abandoned. But we cannot emphasize sufficiently that, notwithstanding how great the importance of the lumbar puncture may be for diagnosis and perhaps also for therapeutics, it is of none whatever as an operative indication, for as long as the clinical phenomena allow an operation, even a purulent liquor containing microorganisms should not stop us from operating.

In connection with the above, I proceed to the discussion of otitic purulent meningitis. A case of healed infectious purulent meningitis is the following:

CASE 8. Otitis media suppurativa chronica dextra. Purulent labyrinthitis with fistula. Extradural abscess. Purulent pachyleptomeningitis.

Radical operation: Removal of the semicircular canals. Opening of the vestibulum and the cochlea. Incision of the dura. Purulent cloudy lumbar puncture. By microscope and culture, gram-positive streptococci.

Hospital report: Anton K., 10 years old, of Inzersdorf, Austria, admitted to the Ear Department of the University of Vienna July 16, 1907.

History: Otorrhea of the right side for four years, which began with pain and stopped at times. In December, 1903, he was operated on at his home; however, otorrhea continued. Since July 13, 1907, severe pains in the ear and head, no vertigo.

Present condition: Findings in the right ear: Copious fetid secretion from the fissure-formed, narrowed external auditory canal. Drum membrane not visible, the soft parts over the mastoid process are thickened, reddened, with an operation cicatrix 2 cm. long, in the middle of which we can see a fistula the size of a quill. Granulations in the mouth of the

fistula. The sound introduced in the direction of the antrum touches rough bone. Considerable fetid secretion comes from the fistula. Mastoid process is painful on pressure. In the microscopic specimen we find no cholesteatin crystals.

Left ear: Drum membrane retracted.

Functional finding: Hearing distance on the left: Conversational speech 8 m., whispered speech 6 m., Weber to the left, Schwabach prolonged on the left, Rinne negative. Perception of high tones normal and of low tones slightly diminished. Watch through the bones positive; there seems to be an apparent hearing distance on the right of $2\frac{1}{2}$ m. for conversational speech and $\frac{1}{2}$ m. for whispered speech; however, the ear tube, 2 m. long, tells us that the patient is entirely deaf on the right.

Vestibular apparatus: Spontaneous nystagmus: Slight horizontal nystagmus to the right in looking to the right. Strong rotatory nystagmus to the left on looking to the left and straight ahead; sometimes also on looking to the right. Caloric irritability on the right diminished. Revolving chair: After ten turns to the right, strong rotatory nystagmus to the left for thirty seconds on looking straight ahead. After ten turns to the left, on looking straight ahead, no nystagmus.

Patient shows pronounced disturbances of equilibrium. Romberg positive. Goniometer: Elevation, facing forwards 8° , facing backwards 6° , on the right and left hand 4° each. Reflexes increased. Babinsky positive. Moderate disturbances of coordination of the right side. Temperature 38.1° . Pulse 50. Patient at present is fully conscious. Movements of the head and neck restricted; slight stiffness of the neck.

July 19. Operation. Skin incision through the scar and fistula. Extirpation of the fistula, curetting the same and exposure of the mastoid process. The latter shows on its lateral surface at the level of the antrum a fistula as large as a quill, in which a rather dry cholesteatoma is visible. Exposure of the sinus and the posterior cranial fossa. The cholesteatoma reaches upward to the dura of the middle cranial fossa. The bony tegmen tympani is completely destroyed. The dura of the middle cranial fossa over the tegmen is covered on the outside with granulations bathed in pus. The cholesteatoma reaches to the inside as far as the labyrinth, forming a fistula 3 mm. long on the front arm of the lateral semicircular canal. Removal of the semicircular canals; opening of the vestibule,

in which no flowing liquor is found; also none in the cochlea, which is opened from the promontorium. The incision of the middle and posterior cranial fossae for about 6 mm. each reveals moderate brain edema. Wound dressing. Introduction of gauze strips into the middle and posterior cranial fossae. Bandage. The lumbar puncture showed 15 ccm. of a very purulent cloudy liquor, expelled under increased pressure. With the microscope, abundant polynuclear leucocytes were found, and with the microscope and culture gram-positive streptococci and bacteria coli were found in the pus from the mastoid process.

Course: July 20, 1907. Patient vomited three times in the last twenty-four hours; complains of headaches; rotatory nystagmus to the left less than before the operation; long-stroked horizontal nystagmus to the right; moderate vertigo.

July 21. Nystagmus unaltered; still some vertigo; change of dressing; shortening of the strips.

July 23. Only slight headaches; nystagmus to the right indistinct; rotatory nystagmus to the left; no vertigo; patient is feeling subjectively well. Change of dressing. Since then the course was uneventful.

July 26. Patient leaves the clinic feeling perfectly well with good equilibrium and is referred to ambulatory treatment.

The present case is of interest in several ways. It is, first of all, striking that the microscopic cholesteatin test (test for cholesteatin crystals) failed, in spite of the large cholesteatoma. This is explained by the fact that the cholesteatoma did not suppurate, but was rather dry, and thus no cholesteatin particles were discharged with the pus.* Of functional importance is the relatively considerable apparent hearing distance (2½ m. for conversational speech, ½ m. for whispered speech) of the positively deaf ear. I have repeatedly referred to the fact that in such cases even the examination with an ear tube 1 m. long is not sufficient, and in the present case we obtained the result characteristic for one-sided deafness only by means of an ear tube 2 m. long† (incorrect repetition of whispered speech).

The appearance of intracranial complications without acute suppuration of the cholesteatoma is also unusual. The intra-

*See G. W. Mackenzie. *Zur klinischen Diagnostik des cholesteatomas*. *Monatschrift f. Ohrenheilk.*, 1908.

†I now use an ear tube 4 m. long, to be had at Rienger, Vienna IX, Van Swieten-gasse 4.

cranial disease itself doubtless started from the tympanic cavity and the labyrinth; which were diseased some time preceding, and consisted of a meningeal disease within the region of the middle and posterior cranial fossae. Especially in the middle cranial fossa, we found considerable changes; the dura was thickened and covered with granulations; the dura of the posterior cranial fossa was simply injected. The leptomeningitis and encephalitis was indicated by the edematous swelling of the brain, and the infectious character of the disease was definitely established by the lumbar puncture. We can, of, course, only surmise as to the anatomic extension of the pachyleptomeningitis. According to the operative findings, it surely extended over the right side of the middle and posterior cranial fossa, and there were surely changes sufficiently advanced to show an abundance of microorganisms in the purulent, cloudy lumbar puncture liquid. As regards the therapeutics, a radical operation was indicated in consequence of the chronic middle ear suppuration. The vestibule and the cochlea were opened, since the ear was deaf and the static labyrinth not irritable, also since vertigo was present, whereas there was no flowing liquor in the labyrinth. Drainage of the intrameningeal spaces was established by an incision of the middle and posterior cranial fossae, and the course of the intrameningeal processes was shown by the lumbar puncture, which at first was, of course, made for diagnostic purposes. I see a special advantage in the change of dressing on the day after the operation and repeating it daily with gradual shortening and renewing of the strips.

This case is in line with the observations of healed purulent otitic meningitis that have been reported to date. However, this is the first case free of any objections and showing streptococci. Gradenigo, we know, was the first who reported a healed otitic purulent meningitis (staphylococci). In the other cases of Bertelsmann, Brieger, Grossmann, Gruening, Leutert, Maljean, Manasse, Preising, Schenke, Schulze and Sokolowski, we generally had to deal with diplococci, once with bacterium coli, and in a smaller number of cases with staphylococci and pneumococci. The healing of streptococcic meningitis has not as yet been proved, and the present case shows us that, at least in exceptional cases, streptococcic meningitis also may get well. Naturally, the authors endeavored to form an established opinion as to the extension of the healed puru-

lent meningitis, whereby they always made the distinction between circumscribed and diffuse meningitis. However, it has been overlooked that this distinction is only possible on the cadaver, and then only by microscopic examination. Thus, either party can be contradicted as to the view that the cases of healed purulent meningitis have been circumscribed on the one hand and that they had to deal with diffuse meningitis on the other hand. The diffuse meningitis, *a priori*, appears to be a dangerous disease, most likely leading to death, and this fact alone must make us think of a circumscribed purulent meningitis when having cases of healed purulent meningitis. Heine has good reasons for stating that the classification into circumscribed and diffuse meningitis is unsatisfactory. Accordingly, in agreement with Lexer, he proposes to entirely abandon the classification of a diffuse meningitis and distinguishes a general meningitis, an encapsulated meningitis and an acute progressive meningitis. The great majority of cases of healed purulent meningitis most likely were of an acute progressive character. Unfortunately, the operative findings do not furnish us any means to judge as to the extension of the process. Indeed, many are inclined to assume that purulent liquor containing bacteria indicates a general purulent meningitis. In certain cases, it may, however, be very difficult to distinguish with certainty between true purulent and purulently clouded liquor, and, therefore, of still greater importance is the fact that in some of the cases observed by me it was determined with certainty that a general purulent meningitis may show only a slightly clouded liquor, which, in some instances, is entirely clear in the beginning. The intensity of the cloudiness is, according to my opinion, not at all determinative as to extent of the disease of the meninges. I also believe that it is of no special significance as to the question of healing. The virulence of the exciting causes of purulent meningitis is, by all means, a very important factor as to the question of healing. Reference has been made to this fact by all investigators, and it is assumed and admitted by all of them that a favorable prognosis of otitic purulent meningitis depends on a mild degree of virulence. According to the latest investigation, we need go no farther and can assume that we have to deal with only slightly virulent, perhaps disintegrated, microorganisms. Another factor seems to me of equal importance and that is the mode of development of the menin-

gitis. The more acute, the more violent the course of the first symptoms, the worse will be the prognosis. A prolonged initial stage and uncertain symptoms during development render the diagnosis of the case more favorable. I, however, thoroughly believe that we must come to the conclusion that with a favorable issue of a meningitis the meningeal adhesions are of very great importance and benefit, as they encapsulate the meningitis and prevent the appearance of a general meningitis. If these adhesions were so frequent, we should see them oftener. In cases of purulent meningitis that I could follow clinically and anatomically, I have observed them perfectly in only one case (see case 6). According to the idea one gets from the autopsy, I do not believe even if such agglutinations occurred frequently, that they would be able to encapsulate the meningitis indefinitely. In making the autopsy, we frequently enough see circumscribed and localized meningitis, especially at the base of the brain, that remained circumscribed in spite of the lack of any adhesions, and during the autopsy of cases of general meningitis, we observed the little or no effect such agglutinations had.

I believe that the mode of development of meningitis is indicated by the first attack. Meningitis which originates directly from a local purulent process in the region of the ear usually from the beginning shows the character of an abscess, which it maintains, and remains localized. The more a purulent meningitis represents a remote consequence of the ear disease, the more apt it is to become a general meningitis from the very beginning. From a practical standpoint, we should consider the following: With the same clinical symptoms of meningitis, the findings during operation will enable us to make a probable diagnosis as to the extent of the meningitis. If the inflammatory changes extend from the ear to a circumscribed focus on the dura and into the dura, we will usually have to deal with a partial, encapsulated or a circumscribed meningitis. If the purulent changes do not extend from the ear to the dura, we have a general meningitis.

The favorable issue of the above case 8 must, in the first instance, be traced back to the success of a sufficient drainage. The meningitis, which certainly extended over the middle and posterior cranial fossae, started from the ear, and the drainage was made by an incision of the dura of both cranial fossae, after an extensive opening of the labyrinth. The exten-

sive incisions of the dura made a repetition of the lumbar puncture unnecessary. As in many other cases, the examination of the fundus oculi showed only a dilatation of the veins, but no choked disc.

Cases have been reported above, in which, with purulent meningitis, we obtained by the first puncture a clear, coagulating and later purulent liquor. We can also report a case of purulent meningitis in which the bacteria-holding liquor remained clear and coagulating during its entire course.

CASE 9. Sandor, T., 11 years old, of Trencsin, Hungary, admitted to the Ear Department of the University of Vienna February 1, 1907.

History: Since the age of four, fetid otorrhea from the right side, after measles, until two months ago without any treatment, when a doctor was seen who prescribed syringing the ear. January 22 patient suffered from a headache and violent pains in the ear, accompanied by fever. Patient became apathetic and at times complained a great deal; could not sleep or eat. Three or four days ago the father of the patient noticed the appearance of a swelling behind the ear that grew rapidly and very soon caused an abnormal way of holding the head. This induced him to bring the boy to the clinic.

Present condition: Weak, thin individual. Temperature 38.5° , pulse 88, and volume of circulation good.

Patient can only walk with great effort and lies mostly in passive dorsal position, without noticing anything. The head is bent extremely to the left and held turned, in which position it is firmly fixed by contraction of the left sternocleidomastoideus. Above the right mastoid process was found an oval swelling of the size of a child's fist and the skin over it was reddened and stretched. The swelling is hard and elastic and shows no fluctuation. The auricle is displaced to the front and downwards. From the tumor an edematous swelling extends over the right side of the face. The right eyelid cannot be opened in consequence of the swelling. The skin over the eyelid is slightly reddened. Ankylostomiasis was present. The edema extends backwards over throat and neck down to the vertebral column. Slight rigidity of the neck. The vertebral column is sensitive to percussion, spontaneous and pressure painfulness of the retroauricular swelling. No cutaneous hyperesthesia. Kernig positive. Patellar reflex,

left normal, right lost. The tongue is swollen and of raspberry color. Fetid breath.

Findings of the right ear: Auditory canal greatly narrowed by the sinking of the posterior superior wall; fetid purulent secretion; in the pus were abundant cholesteatin crystals. The left drum membrane is clouded and retracted.

Functional finding: Left ear approximately normal, the right is totally deaf. No spontaneous nystagmus. Both vestibular apparatus are irritable.

February 2, 1907. Operation under Billroth's mixture narcosis. Skin incision over the convexity of the swelling. The soft parts are thickened. Exposure of the mastoid process. From a subperiosteal surface abscess a great quantity of fetid flaky pus is discharged. On the lateral surface of the mastoid process in the fossa mastoidea were two fistulae the size of a quill; in the mastoid process a cholesteatoma the size of a cherry stone extended as far as the antrum. Plastic according to Panse, typical radical operation. Posteriorly, the cholesteatoma reached as far as the lateral sinus wall, which was of a yellowish white color and thickened in consequence of deposited coagulated fibrin. On the prominence of the lateral semicircular canal we find a rough place 2 mm. long. With the puncture of the sinus blood escaped under normal pressure.

Course: February 3. Subjectively well. Temperature 36.6°. Pulse, regular and strong, 84.

February 4-7. Temperature from 37.9° to 39.5°. Vomiting. Patient takes no interest whatever. Change of dressing. The inner ear is thermically not irritable. Cold tampons dipped into perhydrol or ether do not produce any reaction. Repeated vomiting. Movement of the head is painful. From February 8th on, temperature 36.5° to 37.7°.

February 11. Removal of the semicircular canals and opening of the vestibule; removal of the promontorium and curetting the cochlea. Pus fills all the interior of the labyrinth. Opening of the middle and posterior cranial fossae, puncture of the brain. The lumbar puncture evacuated about 20 ccm. of clear liquor under distinctly increased pressure. After twenty-four hours finest dust-like coagulation and no sediment in the clear liquor. Findings by the Pathological and Anatomical Institute: By the microscope in moderately abundant quantities small gram-negative bacilli. The cultures remained sterile.

February 12. Increased rigidity of the neck and stupor. Temperature 36.5°. Pulse 60. Patient died at 10 p. m.

Post mortem findings: Radical operation on the right ear on account of otitis media suppurativa. Cholesteatoma and subperiosteal abscess in the region of the mastoid process. Pachymeningitis externa et interna acuta in the region of the left cranial fossa (on the external surface of the dura mater, we find only granulation tissue during the autopsy, whereas on the inner surface we find a fibrinous purulent exudate), serous effusion into the brain ventricles, puncture of the right temporal lobe and double puncture of the right cerebellar hemisphere (on the inner brain membranes). Calcified tubercles of the apex of the right lung and coalescence of same.

The meningitis surely existed long before patient was admitted, and the history also indicated that for several weeks patient had been listless and remained in passive dorsal position, at times even unconscious. In making the operation, the cholesteatoma was removed and the labyrinth, which was still irritable, at the time was not touched. Not until after the radical operation, and only when the labyrinth symptoms did not diminish and the irritability of the labyrinth ceased, was the labyrinth opened wide and exposed over the pyramid and the posterior and middle cranial fossae; however, the dura showed no changes within this region. The autopsy findings corresponded with those of the operation. The meningitis was decidedly limited to the middle and posterior cranial fossae of the left or sound side. From it we could not trace an anatomic connection; at least, no macroscopic relation with the ear disease; and it consisted essentially of an external and internal pachymeningitis, which is the kind of meningitis that very frequently shows an intimate and distinct anatomic relation with the original ear disease. (Alexander.)

By the lumbar puncture, a clear liquor was evacuated under increased pressure. After several hours the liquor showed finest white stipplings, and the cultures remained sterile, whereas, on the other hand, by the microscope moderately numerous, small, gram-positive cocci in short chains were found, and also scanty gram-negative bacilli. As already mentioned, the remarkable point of this case is the fact that the lumbar puncture liquor remained clear and colorless up to death, which proves the varying condition of the lumbar puncture liquor in purulent meningitis as regards color and transparency.

Cloudy sterile cerebrospinal liquor is characteristic of brain abscess; yet it is found also in some cases of sinus thrombosis and at times with large extradural abscesses. I have, in the above, treated this important chapter of lumbar puncture and referred to the great diagnostic importance of this fact, and yet exceptions are possible, and it is again the purulent meningitis that causes such exceptions.

CASE 10. Josef Lusek, 21 years old, blacksmith, of Vienna, admitted to the Ear Department of the University of Vienna on February 27, 1907.

Diagnosis: Otitis media suppurativa chronica dextra.

Therapy: Radical operation. Opening of the posterior and middle cranial fossae. Puncture of the cerebellum.

History: Since the age of four, otorrhea of the right ear, following measles. It is an intermittent otorrhea, beginning usually with pains and lasting for some days. Three weeks ago otorrhea began again, and since then patient has had violent headaches on the right side; during the last few days, he has had chills, marked vertigo, apparent turning of the surrounding objects, and several times has vomited. For some days, patient has been treated at the ambulatorium of our clinic. Yesterday patient collapsed in the street and was brought in to our clinic by the First Aid Society.

Patient vomited three times during night and once in the morning.

Right	Left
By means of the ear tube conversational speech is heard however incorrect- ly repeated.	
} .. Conversational speech.....9 m.	
O	Whisper9 m.
O	Acumeter9 m.
.	Weber+
.	Schwabach shortened
.	Rinne+
.	C ₁+
.	C ₄+
—	Watch+
—	Acumeter+
+.	Spontaneous nystagmus+

Typical reaction caloric nystagmus, rotatory, long-stroked; typical reaction galvanic nystagmus, rotatory, long-stroked. Disturbance of equilibrium: vertigo with the slightest motions; with closed eyes considerable disturbance.

Present condition: Strong individual of medium height. Patient stays in bed and, as he states himself, the slightest motion, even that of his eyes, causes vertigo. Patient cannot sit up. Temperature 37°. Pulse strong and regular 78.

Right ear: Fetid pus, cholestearin crystals. Total destruction of the drum membrane; granulations in the tympanic cavity. Left ear normal.

Lumbar puncture yielded a slightly clouded liquor under normal pressure. The microscope showed no microorganisms, but polynuclear leucocytes.

March 1, 1907. Operation in Billroth's mixture narcosis. Typical skin incision. Exposure of the mastoid process. The cortex is hard. The interior is fetid, purulent and soft. In the attic and antrum a fetid, ichorous cholesteatoma was found. Prominence of the lateral semicircular canal was unaltered. Granulations on the base of stapes. Wound dressing. Bandage.

March 3. Patient feels somewhat better, vomited several times. Facial paresis with its phenomena.

March 4. Patient complains of great vertigo. Vomited several times during night. Nystagmus to the sound side; patient complains of diffuse headaches. Temperature normal. Pulse 52.

March 5. Patient feels better. No vomiting. Long-stroked rotatory nystagmus to the sound side and some short strokes to the diseased side.

March 6. Vertigo still present. Nystagmus to the sound side. Patient feels better and did not vomit.

March 7. Patient has a severe headache. Increased vertigo to-day. Patient can walk only with support. Temperature 38°; pulse 88. At 6 p. m. operation was made by Alexander. Fetid labyrinth suppuration. Dura of the posterior and middle cranial fossae bulged forward and was injected. Removal of the labyrinth as far as the inner auditory canal. Opening of the cochlea. Function of the cerebellum negative. Wound dressing.

March 8. Patient unconscious. Temperature 36.9°. Pupils wide, unequal and not reacting. Pulse slow (60 a minute).

March 9. 7 a. m., patient died.

Post mortem result: Purulent basal meningitis with special localization of the exudate over the right border of the pons, including the nerve branches running alongside, chronic puru-

lent middle ear inflammation on the right side. Acute edema of the leptomeninges and the brain. Pachymeningitis externa beginning to perforate and fresh internal pachymeningitis in the region of the posterior and middle cranial fossae.

Chronic emphysema of the lungs. Parenchymatous degeneration of the heart and the liver. Acute splenic tumor. Bacteriologic findings in the smear preparation of the meningeal exudate: Abundant mono- and polynuclear cells; a few gram-positive cocci, as well as gram-negative short rods of the type of the bacillus of influenza.

We have to deal with a basal purulent meningitis with encapsulation of the exudate between the brain surface and the leptomeninges.

On the right edge of the pons and on the nerve branches running along the same, especially along the acoustic and facial, the exudate was heaped up into circumscribed tumor-like masses. This localization explains the peculiar findings of the lumbar puncture. From this suppurative focus, leucocytes entered the cerebrospinal liquid, but no microorganisms, and thus the lumbar puncture showed, under increased pressure, a cloudy, coagulating liquor without any microorganisms. The meningitis surely existed before patient was admitted to the clinic, as indicated by the history of vomiting and violent headaches. In spite of extensive exposure of the brain and free drainage, we did not succeed in preventing the fatal issue. It was evident at the time of the operation that the vitality of the patient was greatly reduced, also the acute edema of the leptomeninges and the acute brain edema showed that the inflammatory process had already extended from the meningeal suppurative focus to the base of the brain and over the entire meninges and the brain. The hopelessness of this case was demonstrated at the post mortem examination by the pulmonary emphysema, the parenchymatous degeneration of the heart and liver.

CASE 11. Florian G., 24 years old, farmer, of Loich, Austria, admitted November 12, 1906.

Diagnosis: Otitis media suppur. chronica dextra. Cholesteatoma. Chronic labyrinth suppuration. Caries of the temporal bone. Meningitis tuberculosa.

Therapeutics: Radical operation. Plastic after Panse. Opening and removal of the labyrinth. Exposure and puncture of the dura of the middle and posterior cranial fossae.

History: Patient had measles between the age of 4 and 5, influenza between 9 and 10 and typhus when he was 17. In connection therewith he began to suffer with the right leg, having had typhoid fever for six months. After convalescence from influenza, fourteen or fifteen years ago, patient developed right-sided headaches and pains in the ear; two weeks later otorrhea appeared, when the pains in the ear stopped; however, the otorrhea continued with short intermissions. When the otorrhea ceased for a short time, pains in the ear occurred again that lasted until otorrhea began.

The ear discharge was copious in the beginning; later on less, but always fetid. Eighteen days ago otorrhea stopped again and patient again had pains in his ear and head on the right side. For two weeks he had a retroauricular swelling and the pains in the ear and head became so intense that the patient could not sleep. Since then patient often has attacks of vertigo; however, the vertigo was not decided. There is no apparent turning of the surrounding objects, and it is limited to the head. Patient staggers in walking; no vomiting. In spite of having been treated, the headache did not diminish; two days ago otorrhea began again and one day ago a physician in the country cut or punctured his ear, whereupon otorrhea increased and headaches somewhat decreased. Since patient began to suffer with the ear, his hearing is bad, and since eighteen days (i. e., since he has violent pains in the ear and head), patient's hearing is still worse. He had no chill, only when the headaches were specially severe, he became very warm and perspired. At this time patient complains of moderate pains in the ear and head, otorrhea and bad hearing.

Status praesens: Well developed and well nourished individual. No pathologic changes are found in his abdominal and thoracic organs. Temperature 38°. Facialis free.

Left ear: Drum membrane somewhat retracted and cloudy.

Right ear: In the external auditory canal abundant, fetid pus; marked narrowing of the external auditory canal by the sinking of the posterior upper wall; granulations on the same between which pus exudes. In probing this place, we touch soft masses and rough bone. There is a boggy swelling over the mastoid process and the skin is reddened and stretched. The mastoid process is painful on pressure. In washing out the fistula, abundant cholesteatoma masses escape, which contain cholestearin crystals.

FUNCTIONAL FINDING.

Right	Left
With ear tube 2.2 m.	Speech Z. W.
O	Whisper 2-3 m.
O	Acumeter 8 m.
.	Weber +
Shortened	Schwabach Normal
Air conduction absent.	Rinne +
O	C ₁ +
Greatly diminished	C ₄ +
-	Watch +
+	Acumeter +
O	Spontaneous nystagmus O

With cold water, caloric nystagmus, typical reaction; both sides show normal nystagmus after turning.

Standing with closed eyes, patient falls a little backwards and to the diseased side. With closed eyes, patient walks with broad gait and staggers. With eyes open, patient walks well backwards, and also the hopping is good. No ataxia.

November 13, 1906. Operation in Billroth's mixture narcosis. Typical skin incision 7 cm. long. Soft parts thickened. Exposure and opening of the mastoid process; cortex hard. The posterior bony wall of the auditory canal and the interior of the mastoid process are destroyed; in the latter, we find an ichorous cholesteatoma a little larger than a hazel nut, which caused the destruction of the posterior wall of the auditory canal.

The skin of the auditory canal is also partly destroyed. Radical operation, plastic according to Panse. Over the horizontal semicircular canal a small osteophyte of the size of a pea, that caused a narrowing of the antrum. Below the semicircular canal was a discolored bone particle reaching up to the facialis and the fenestra ovalis. Removal of the same. No fistula was found. Wound dressing. Bandage.

After operation: Spontaneous nystagmus to the sound side. Facial paresis in the maxillary branch.

November 14. Moderate headaches on the right side; vertigo; subfebrile temperature. Spontaneous nystagmus to the sound side.

November 15. Moderate pain in the ear and head on the right side. Vertigo less. Nystagmus the same as the day be-

fore. Subfebrile temperature. Entirely conscious. Purgative.

November 16. Morning temperature 36.6° . Violent headaches. Faintness. Nystagmus idem.

November 16. 1 p. m., temperature 39° . Violent headaches. Nystagmus to the sound side less than the previous day. 2 p. m., Violent headaches. Vomiting; moderate stupor. 4:30 p. m., temperature 40.5° . Pain also in the forehead. Vomiting; stupor; slight spontaneous nystagmus to the sound side. 5 p. m., labyrinth operation under Billroth's mixture narcosis.

1. Lumbar puncture 20 ccm.; clear liquor containing smallest specks, which is evacuated under high pressure (sterile by microscope and culture).

2. Change of dressing. Long-stroked nystagmus to the sound side, after having exposed the dura of the middle and posterior cranial fossae. Opening and removal of the labyrinth, preserving the facial canal. The cochlea and all labyrinth channels are filled with intense fetid caseous pus. Incision of the dura of the middle and posterior cranial fossae. Puncture of same with negative result. After the operation, violent headaches in the evening. Temperature 40.5° . Ice bag on the head.

November 17. Headaches diminished, owing to the ice bag. Temperature 38° . No vertigo. No vomiting. Faintness, but no stupor. No spontaneous nystagmus. Pupils narrow with slow reaction to light. Pulse slow. Temperature, in the afternoon, 39.5° .

November 18. Very intense headaches. Temperature 38° , ice bag. Otherwise the same as yesterday. Temperature in the afternoon 39.4° . Evening: During day nausea occurred several times. As soon as patient takes some nourishment, he vomits it. In the evening vomiting ceased. Patient takes moderate amount of food. Retention of urine during the entire day. In the evening spontaneous urination.

November 19. Headaches somewhat diminished. Temperature 38.1° . Change of dressing. Shortening of the strips. Slight spontaneous nystagmus to both sides. No vertigo. Temperature in the afternoon 38° .

November 20. Headaches. Temperature 37.1° . Herpes. Abducens paralysis on the right. Spontaneous nystagmus to the sound side. Temperature in the afternoon 38.3° .

November 21. Restless night; headache; temperature 37.1°. Afternoon temperature 37.8°. Pyramidon.

November 22. Moderate headaches. Spontaneous nystagmus to the sound side. Temperature 36.8°. Change of bandage. Change of strips. Very little fetid secretion. Temperature 37.8° in the afternoon. No vertigo.

November 23. Moderate headaches on the right side; no other complaint. Takes nourishment very well. Temperature 37°. Spontaneous nystagmus to the sound side. Temperature 39.9° in the afternoon.

November 24. Status idem. Temperature 37°. No vertigo. Nystagmus idem. Temperature 37.9° in the afternoon.

November 25. Slight headaches on the right; otherwise patient feels well. Temperature 37°. Change of bandage. Profuse secretion.

November 26. Status idem. Nystagmus idem. Temperature 37.1°. Temperature in the afternoon 37.8°. Violent headaches.

November 27. Patient feels well. Temperature 36.8° to 36.9°. Change of bandage. Moderate secretion. Nystagmus idem.

November 28. Patient feels well. Temperature 36.6° to 36.8°. Nystagmus idem.

November 29. Patient feels well. Temperature 36.5° to 36.7°. No vertigo. Change of bandage. One sequestrum was discharged.

November 30. Patient feels well. Leaves his bed for a few hours. Temperature 36.4°. Moderate spontaneous nystagmus to the sound side. Temperature suddenly rose to 40.9° in the afternoon. Faintness. Change of bandage. Moderate secretion.

December 1. Temperature 37.3°. Moderate headaches. Spontaneous rotatory nystagmus to both sides; more so to the sound side than to the diseased side. Temperature 37.5° in the afternoon.

December 2. Temperature 37°. Patient feels very bad. Change of bandage. Abundant secretion. Vomits often during the forenoon. Spontaneous nystagmus to the sound side. Temperature 39.3° in the afternoon. Headaches. Violent vomiting.

December 3. Temperature 40.4° at 8 a. m. Pulse 88. Spontaneous nystagmus to both sides, less to the diseased side.

Restless night; vomited often. Violent headaches. Moderate stupor; no convulsions; no delirium. Stiff neck. Painfulness on pressure on the cervical portion of the vertebral column. Pupils contracted and slowly reacting to light. Change of dressing. - Non-fetid pus in the labyrinth cavity, the exposed dura of the middle cranial fossa strongly bulging forward. Puncture negative. Forenoon: Beginning edema pulmon. Somnolence. Retention of urine. Catheterization.

Noon: Status idem. Cyanosis. Pupils narrow. Pulse 120. Injection of camphor. 5 p. m., beginning of agony. Patient died at 11 p. m.

Post mortem result (Hofrat Weichselbaum): Radical operation had been made on account of chronic purulent middle ear inflammation and formation of cholesteatoma; there was an old abscess in the right temporal lobe, close under the surface and reaching forward to the inferior cornu of the lateral ventricle without breaking into the latter; the abscess was about as large as a walnut and contained thick pus; in correspondence therewith we found a loss of substance on the surface on the temporal lobe, which had a shallow opening; however, in no relation with the abscess cavity; circumscribed, fibrinous leptomeningitis on the convexity of the left frontal lobe and fibrinous leptomeningitis spinalis on the posterior surface of the spinal cord. Hydrocephalus internus acutus. Lobular pneumonia in both lungs; parenchymatous degeneration of the liver and kidneys.

In this case, the same as in the previous one, we have to deal with cholesteatoma and labyrinth suppuration with meningitis. The clear lumbar puncture which was evacuated under increased pressure contained a few very small white stipplings and was sterile. The case is interesting insofar as besides the meningitis, there was also an abscess in the temporal lobe. The meningitis extended over the left frontal lobe and the spinal leptomeninges.

This case illustrates the rare combination of a labyrinth suppuration with an abscess of the temporal lobe, originating metastatically from the suppuration of the semicircular canal. The meningitis also doubtless was of metastatic origin, as shown by its affecting the side of the sound ear and the vertebral column.

In conclusion, I am going to report on two cases of tuberculous caries of the temporal bone and meningitis with negative findings in the lumbar puncture liquor:

CASE 12. Thomas W., of Aussergefild, in Bohemia, Austria, 39 years old, tailor, admitted November 14, 1905.

Diagnosis: Otitis media suppur. chronica sin.; fistula in the fossa mast.; destruction of the greatest part of the posterior wall of the auditory canal; tympanic cavity filled with granulations. Labyrinth diseased. Softening of most of the petrous bone.

Therapy: Radical operation; removal of the labyrinth and of the entire petrous portion of the temporal bone to the tip; plastic according to Panse.

History: 1904, amputation of the left leg below the knee in consequence of caries. Since June, 1904, otorrhea on the left, beginning with slight pain. Since three weeks a pressure sensation has often been felt in the ear; headaches on the side of the diseased ear; no vertigo; no sensibility to pressure on the mastoid process.

Right ear: Normal drum membrane.

Left ear: Auditory canal filled with polypi and much secretion.

DISTURBANCES OF EQUILIBRIUM.

Right	Left
Normal Speech	Deaf
Normal Whisper	Deaf
+ Weber	—
+ Rinne	—
Good C ₁	—
Good C ₄	—
+ Watch	—

No nystagmus, no swaying with closed eyes.

November 16, 1906. Radical operation in Billroth's mixture narcosis. Typical skin incision; exposure of the mastoid process. A fistulous opening of the size of a lentil in the fossa mastoidea filled with granulations and cholesteatoma. The sound passes through this into a cavity of the size of a cherry stone, filled with purulent cholesteatoma, at the upper part of the mastoid process. The posterior wall of the auditory canal has been destroyed except the medial portion. After the removal of the rest of the posterior wall of the auditory canal and the lateral attic wall, the entire cavity is seen filled with granulations and pus. The purulent softening and formation of granulations also reach into the labyrinth. The entire labyrinth cavities are filled with pus and granulations. The entire

petrous bone and the labyrinth are removed as far as the tip of the former. The latter we let remain in its place since, being elastic, continuing our work with the chisel or the bone forceps might cause a luxation of this portion. It seems that the bony portion that is left is also diseased; at least, that part turned to the wound cavity. In removing the labyrinth, the facial nerve is removed in its entire course through the petrous portion of the temporal bone. The purulent softening also reaches to the sinus, the lateral wall of which is exposed the size of a bean and covered with granulations. Plastic according to Panse. Wound dressing. Bandage.

November 17. In dorsal position; horizontal nystagmus to both sides.

November 18. Rotatory nystagmus to the right with inclination of head to the sound side. Findings of the Pathological and Anatomical Institute of November 21st: Microscope: gram-positive cocci in pairs and gram-negative bacilli.

Culture: Staphylococci pyogenes. Anaerobic negative.

November 23. First change of bandage. Removal of strips.

November 24. Secondary suture.

November 29. Removal of sutures.

December 3. Wound closed. Patient without bandage.

December 17. For some days slight increase of temperature; nausea; violent vomiting.

The lumbar puncture reveals a clear liquor under ordinary pressure. After six hours slight coagulation. No microorganisms.

December 19. Since yesterday forenoon unconsciousness. Cheyne-Stokes respiration. Involuntary discharge of urine.

December 20. Patient arouses when accosted and slowly answers questions; complains of headaches; distinct ataxia on the left side; paralysis of the eye muscles.

December 21. Death.

Post mortem result: Acute tubercular leptomeningitis at the base of the brain and to a less degree on the lateral portions of the vortex. A caseous tubercle of the size of a nut in the right temporal lobe.

Chronic tuberculosis with dry caseation of the cervical lymphatic glands, the trach-bronch., and the bronch-pulm. lymphatic glands; the anterior and posterior mediast., the retroper., the mesent., and the lymphatic glands at the entrance to

the liver and spleen; the ing. and axill. lymphatic glands. Chronic tubercles in the spleen and liver. Adhesive pleuritis of the right lung. A cold abscess on the right side of the thorax. Radical operation of the left ear (November 17) on account of chronic otitis and caries of the petrous portion of the temporal bone. Fresh incision wound of the right cerebellar hemisphere.

According to the clinical examinations, the radical operation, as well as the resection of the petrous portion of the temporal bone, the latter being diseased, were indicated. After the resection of the base of the petrous portion and the entire labyrinth, the tip of the petrous portion appeared as a pointed sequestrum, so that its extraction threatened to injure the carotid and was therefore not removed; however, it was hoped that later on the tip would come away spontaneously.

Unfortunately, this hope was not fulfilled. It is true that the condition of the patient was satisfactory for some time. He was even able to walk around. Finally, however, he was attacked by a tubercular meningitis. The post mortem revealed a tubercle in the right temporal lobe, a chronic tuberculosis of almost all the internal organs, a cold abscess, etc. So a cure was a priori impossible. The indication for the mastoid operation was given as a vital indication by the labyrinth symptoms. The course of the case is a type of tubercular labyrinthitis, complicated by tuberculosis elsewhere (lymph nodes, lungs, abdominal viscera, bones and joints).

Ear disease with multiple bone and joint tuberculosis appears less unfavorable prognostically than other forms of tuberculosis. At least, I can report three cases operated for otitis media suppurativa, with multiple bone and joint tuberculosis, which got well after resection of the petrous bone and removal of the labyrinth and have remained well three to five years after the operation.

All other cases—not immediately, it is true, but three weeks to six months after the operation—have died of tubercular meningitis. I remember a case demonstrated by me early this year before the Austrian Otological Society.

Lumbar puncture was performed twice, obtaining a clear liquor each time. It contained no microorganisms, nor could tubercle bacilli be found, even after a long search. It is true that the puncture was made early, four weeks before death.

The following case shows meningitis tuberculosa with nega-

tive lumbar puncture findings, taken seventeen days and eight days before death:

CASE 13. Emil Sch., Vienna, 14 years old, student, admitted June 22, 1906.

Diagnosis: Otitis media supp. chronica dextra. Meningitis tuberculosa.

Therapy: Radical operation. Exposure of sinus. Exposure and exploration of the middle and posterior cranial fossae. Lumbar puncture.

History: Patient had scarlet fever when eighteen months old. For five years he has had profuse otorrhea on the right side, slightly fetid. Since two months patient complains of pains in the right ear, which, however, became less lately. Three weeks ago, for the first time, polyps were removed from the ear, and sixteen days ago, for the second time, whereupon the otorrhea stopped. For five days patient complains of headaches; for two days occasional vomiting and more violent headaches. Rest in bed. Patient's hearing is worse on the right side since the beginning of his ear disease. When patient was relieved, he complained of moderate headaches. Patient's physician made attic washings on account of cholesteatoma.

Present condition: Well nourished individual of medium height and weak structure of bones and moderately developed muscles. No pathologic changes in the thoracic and abdominal organs. The skin and the visible mucous membranes are pale. Patient lies in passive dorsal position, most of the time completely motionless and sometimes he makes rapid motions of short duration with his body and extremities. Active movements of the head and neck are avoided; passive motions of same may be made with some resistance. Patient cannot walk about. Reflexes unaltered. Pulse 72, respiration 28, temperature 37.8°.

Left ear: Tympanic membrane normal.

Right ear: Tympanic membrane absent in its greatest portion; only the Shrapnel membrane is present. The stump of the malleus is grown to the inner wall of the tympanic cavity. From the attic and antrum only slight granulations reach into the tympanic cavity, which contains scanty, fetid secretion. The promontory wall in its greatest part is epidermized. From behind and above, with aspiration by means of Siegle's speculum, some pus and cholesteatoma are brought to view. The

region of the mastoid process is unaltered. No sensibility to percussion of the skull. No pain by point pressure on the vertebral column.

Right	Left
10 m	Speech Normal
A. C	Whisper Normal
+	Weber
—	Rinne
Strong stroke +	C ₁ Normal
Strong stroke +	C ₄ Normal
—	Watch
—	Acumeter +

Spontaneous nystagmus slight to left side; caloric nystagmus (when in bed); applying cold water, very strong horizontal nystagmus to the sound side (left); also on looking to the diseased side, afterwards vomiting.

Spontaneous nystagmus slight to left side. Caloric nystagmus (when in bed), applying cold water; very strong horizontal nystagmus to the sound side (left), also on looking to the diseased side; afterwards vomiting.

The patient being stupefied, the examination on the revolving chair and for disturbances of equilibrium cannot be carried out, and for the same reason the functional examination is not free from objections.

Consciousness is so obtunded at times that patient does not even answer quite simple questions, whereas after a few minutes quite often correct and prompt answers are obtained. Patient recognizes and designates properly the objects shown him (watch, key, water glass). He cannot find the name for pen holder; however, when he is asked whether it was a pencil or a tooth pick, he promptly says "No," and when asked: "Is this a pen holder?" he will answer "Yes!" The right nasolabial wrinkle is somewhat obliterated. Facial twitchings can not be observed at this time. Slight paresis of the right abducens. Palpation and temperature examinations reveal normal reaction if made when patient is clearly conscious.

Fundus oculi normal. At 8:30 p. m., vomiting.

At 9 p. m., June 22, 1906. Operation in Billroth's mixture narcosis. Lumbar puncture: Clear liquor is discharged under high pressure, in which, however, individual, fragile, fibrinous flocule may be seen (by microscope and culture sterile).

Typical skin incision. Chiseling out of the mastoid process, which, in its greater part, was pneumatic. In the cells around the antrum is some fetid pus. After the removal of the posterior wall of the auditory canal, in the upper part of the tympanic cavity and in the antrum was found a suppurating cholesteatoma of the size of a cherry stone, that had destroyed the roof of the antrum. The dura is bare here about the size of a copper and by the removal of the softened bone in the neighborhood is exposed to the size of a quarter. It is covered with granulations. Typical radical operation. Plastic according to Panse. Sinus exposed the size of a lentil, its wall being normal. Incision of the exposed dura of the middle cranial fossa and puncture of the temporal lobe: The edematous brain protruded. Wound dressing. Bandage.

June 23. Horizontal nystagmus to both sides; very strong to the left; very weak to the right.

June 24. Nystagmus to the right (diseased) side no more present; however, very strong to the sound (left) side.

June 23. Patient is lying in passive dorsal position, the eyelids not completely closed. He gives tardy answers to repeated simple questions. Sudden convulsions and moderate facial twitching. Head motions somewhat restricted. Patellar reflex diminished. Temperature 38°. Pulse 100.

June 23, p. m. Vomited twice. Otherwise condition is the same. Temperature 38.5°.

June 24. a. m. Stupor. Patient feels better subjectively; answers more promptly; no restriction of the cervical movements. Temperature 38°.

June 24, p. m. Status idem. Temperature 37.8°.

June 25. Frequent vomiting. Restless sleep; minimum of food taken. Stupor as yesterday. Temperature 37.9°.

June 25, p. m. Status idem. Temperature 37.6°.

June 26. No vomiting. Deep stupor. Temperature 37°. Change of dressing. Removal of the drain. Brain prolapse. Wound dressing. Bandage.

June 26, p. m. Temperature 36.8°.

June 27. No vomiting. Restless; little sleep. Temperature 38°.

June 28, p. m. Subjectively better. Patient spoke only a little with his relatives. Takes nourishment better.

June 29. Increasing stupor. No answers to questions. Sleep restless. Temperature 38.6°.

Change of dressing. A brain prolapse the size of a walnut, red violet. Removal of same. Drainage of the dural opening. Wound dressing. Bandage.

June 29, p. m. Increasing coma. Temperature 38° .

June 30, a. m. Great apathy. No answers to questions. Pupils wide; reaction very tardy. Temperature 36.7° . Pulse 80, moderately strong. Involuntary passage of urine. Collapse.

With lumbar puncture slightly cloudy liquid escaped with high pressure.

Change of dressing. Removal of the drain. Brain prolapse. Again exploration of the middle cranial fossa, exposure and exploration in front of the sinus of the posterior cranial fossa with negative result.

June 30, p. m. Temperature 38.1° .

July 1. Great apathy; incontinence of urine and feces; minimum of food taken. Temperature 37.6° . Pulse 84 and weak.

July 4. Apathy less. Eats more. Patient seems to recognize his relatives. Change of dressing. Shortening of the drain strips.

July 8. Death.

Post mortem result: Tuberculous meningitis of the base of the brain, the vertex and right hemisphere. Puncture wound of the right temporal lobe, as well as the right cerebellar hemisphere. Suppuration of the puncture channel of the cerebellum. Operative opening of the middle and posterior cranial fossae after the radical operation. Lobular pneumonia. Purulent bronchitis. Calcified lymphatic glands (bronchial glands).

Bacteriologic result: In the pus of the cerebellar exploration wound streptococci.

The question now arises what practical clinical value has lumbar puncture in meningitis? We will contrast importance of the lumbar puncture for the diagnosis, the seat of the disease, and the treatment.

As to the pressure under which the liquor of the lumbar puncture is discharged, we have many variations. Increased evacuation pressure is a sign of increased intrameningeal pressure and always a sure sign of meningitis; in which case, we chiefly have to deal with serous meningitis or diffuse purulent meningitis. Normal evacuation pressure is frequently

found with tuberculous meningitis and sometimes also with purulent meningitis, especially with the latter when considerable purulent exudate is present, rendering cerebrospinal liquor less fluid. Such changes can cause the pressure of the liquor, less than normal (Körner). A special apparatus is not necessary for measuring the evacuation pressure. An approximate estimation will do for clinical purposes; with normal pressure the liquor is evacuated in the arc of a circle, with increased pressure in the arc of an ellipse in a strong stream, and with decreased evacuation pressure in an angle with the acupuncture needle or in drops. A negative result of the lumbar puncture is observed in rare instances, when it is a sign of purulent meningitis, with a moderately thick exudate in the posterior cranial fossa and an obstruction of the foramen Machandi, or a sign of spinal meningitis. Finally we cannot see exactly why stress should be laid upon the distinction between circumscribed and diffuse forms only with purulent meningitis, whereas the serous meningitis is usually a priori looked upon as a diffuse form.

Surely there will also occur cases of circumscribed serous meningitis, especially in cases of labyrinthitis or pyemia (sinus phlebitis), a fact which is of great importance from a therapeutic standpoint.

Rapidly disappearing mild meningitic phenomena are sometimes observed with acute middle ear suppuration. The lumbar puncture reveals in these cases either a clear or cloudy liquor evacuated under increased pressure. This form of meningitis, however, represents sometimes only a preliminary stage of a tubercular meningitis. Finally there are still more chronic forms of purulent meningitis, which, like the brain abscesses, show an initial and latent stage; a manifest and a terminal stage. These stages are known in literature (Brieger, Körner, Voss). Brieger proposed for them the appellation, "chronic intermittent meningitis."

The color of the cerebrospinal liquor is diagnostic from an otologic standpoint. Clear, yellowish liquor is sometimes found with tubercular meningitis; on the other hand, a characteristic color of white or yellow, at the same time cloudy, almost always indicates a purulent meningitis. The transparency is of greater importance. If the normally clear liquor contains very small white dots or threads, accompanied by the clinical phenomena of meningitis, we are likely to have same.

However, we must call attention to the fact that if the suppurative foci are very near to the intrameningeal spaces, considerable cloudiness of the cerebrospinal liquor can be observed, without, however, finding during the operation or perhaps at the autopsy even any trace of inflammatory changes in the meninges themselves (Körner, Voss). As to the microscopic findings, the picture of purulent meningitis is very characteristic, polynuclear leucocytes and microorganisms.

The microscopic examination is not sufficient by which to judge an individual case, as bacteria, that can be easily found by staining, may prove to be sterile by culture or completely innocuous (experiment on animals). In the majority of cases cloudy, grey or yellowish liquor holds bacteria, but my experience has been that even clear liquor may contain bacteria, while a cloudy liquor, free of microorganisms, may represent, on the other hand, typical pathologic changes of the cerebrospinal liquor, of which we shall speak later. Finally, the liquor may be found still clear and sterile with already fully developed clinical symptoms of a purulent meningitis. As to the demonstration of tubercle bacilli in the liquor, we would refer to Breuer's Method.

The appearance of coagulation in liquor that has stood for three to twenty-four hours is of the greatest importance for the diagnosis. Especially in those cases where clear liquor is evacuated by the puncture, this appearance of coagulation indicates a meningeal change, and is thus characteristic for meningitis serosa. Attention must be paid to the fact that the liquor is preserved from any artificial admixture of blood, as such an admixture—even if only in a slight degree—may give rise to formation of coagulation, even in decidedly normal liquor. I, therefore, catch the discharge from the lumbar puncture always in three test tubes, so that in case some blood comes into the needle lumen when making the puncture, it may be received isolated in the first test tube. From the technical standpoint, it may be briefly mentioned that we always make the lumbar puncture by means of an ordinary hollow needle provided with a mandrin, and sucking never is used. The application of a pressure measuring instrument, according to the above statement, therefore, appears to be superfluous, the more, as it may easily contaminate the liquor and cause the unfavorable accident of an infection of the spinal intradural spaces. Especially when examining for staphyloc-

cocci, great care has to be taken, as same may be found in the liquor from external sources.

What diagnostic value, then, has lumbar puncture? We will obtain a good general idea by summing up the several results of examination; i. e., the evacuation pressure, color, transparency, microscopic condition, and coagulability in one table:

	Normal	Meningitis Serosa	Meningitis Tuberculosa	Meningitis with Brain Abscess or Thrombosis	Meningitis Circumscripta	Cerebrospinal Liquor Mixed With Blood	Meningitis Hemorrhagica
Evacuation-Pressure	N.	Incr'd	N.	N.	N.	N.	Incr'd
Color	—	—	—	Incr'd Grey	Increased or diminished Purulent yellow	red	red
Transparency . .	+	+	+	cloudy	cloudy	cloudy	cloudy
Microscopic Findings	L.	L.	L. Tbc.-bac.	L. P. M.	L. P. M.	L.	L. P.
Coagulability . .	—	+	+	+	+	+	+

L=lymphocytes P=polynuclear leucocytes M=micro-organisms

Of special importance is the result of the lumbar puncture with purulent inflammatory diseases near the dura, having, however, an extradural course; i. e., with purulent sinus phlebitis and large extradural abscess. Here we always find more or less numerous polynuclear leucocytes in the liquor. Sometimes cloudiness of the lumbar puncture liquor depends upon great numbers of leucocytes, bacteriologically the puncture being entirely sterile.

We find something analogous to the above in non-perforated brain abscesses that are in no direct relation with the intradural spaces. However, the cloudiness in these cases is very strongly pronounced.

I demonstrated such a case in the Austrian Otological Society, October 30, 1908. H. K., 6 years, admitted with symptoms of meningitis and abscess of left temporal lobe (dysphasia, bradyphasia, right hemianopsia, paresis right upper and lower extremities). Admitted October 9, 1905. Otitis media sup. chron. sin.; abscesses lobi temp. sin. The cloudy cere-

brospinal fluid contained mono- and polynuclear leucocytes, but no bacteria.

Also the meningitis caused by labyrinth suppuration is of special importance (see Zeitsch. f. Ohrenheilk., 1908).

Even if the polynuclear leucocytes in the liquor do not indicate a purulent meningitis, this finding proves that the meninges are no more normal. That, notwithstanding the result of the lumbar puncture, sometimes no clinical symptoms of a meningeal disease arise and no meningitis is found when making the autopsy, proves nothing. It is positive that for the appearance of clinical meningeal symptoms a certain and by no means low degree of inflammatory changes in the meninges must be presupposed. However, even the macroscopic autopsy finding is not reliable, for, in order to prove the early stage of a meningitis, a microscopic examination of the meninges, and especially of the brain surface, is absolutely necessary. This, however, did not take place in the negative cases reported by Voss.

If we wish to estimate the importance of the lumbar puncture as an indication for operation, it is possible only to take into consideration the results that can be obtained macroscopically in the fresh liquor or by the immediate microscopic examination. It is imperative and long since admitted that if an operation comes into question at all, it must be made immediately. We, therefore, must in no case delay the operation until the formation of coagula and the culture or experimental conditions have been examined. Already here the importance of the lumbar puncture as an operative indication is strongly diminished and is displaced entirely into the background if we refer to the cases of meningitis that healed after operation. The lumbar puncture is of greatest value in a clinical way on account of its rapid and harmless performance. It gives us exact information as to the condition of the meninges at the time of the operation (in case that the lumbar puncture is made immediately after the cranial operation, as I always do), which is of considerable interest. There is no doubt that in earlier times that meningitis which developed clinical phenomena post operatively, and after a rapid course ended fatally, was ascribed to the operation. By the lumbar puncture, we are now informed about the condition of the meninges at the time of the operation. The result of the lumbar puncture, however, cannot provide any contraindication against the

operation. We have fortunately overcome the standpoint that a cloudy lumbar puncture contraindicates an operation. We certainly, thereby, do not mean to say that we should operate also every far advanced case of purulent meningitis. An unfavorable prognosis of an operation can, however, only be foretold by the clinical symptoms of the patient (deep coma, paralysis, Cheyne-Stokes), and never by the result of the lumbar puncture. Again, we must always remember that even a very marked purulent, cloudy liquor may occur in cases of brain abscess, labyrinth suppuration or sinus thrombosis (Körner, Voss).

We now proceed to the discussion of the operation. The first demand is to remove the suppurative focus from the ear as completely as possible. We accomplish this in acute cases by antrotomy and in chronic cases by the radical operation. With simultaneous suppuration of the labyrinth a wide opening of the labyrinth spaces starting from the vestibule and the promontorium is indicated, at the same time removing the petrous bone, until we obtain an unhindered flow of the liquor; so in some cases, it becomes necessary to expose the inner auditory canal.

In operating purulent meningitis, the object is the free drainage of the middle and posterior cranial fossae, which chiefly are involved in otitic meningitis. We accomplish this purpose by first removing the lower part of the squama, and the tegmen tympani. Then the sinus and the dura of the posterior cranial fossa in front and behind the sinus are exposed and by the removal of the upper edge of the petrous bone, both openings to the size of a dollar are connected at the level of the tentorium. In cases of labyrinth suppuration the exposure of the dura of both cranial fossae precedes the labyrinth operation.

Finally we must see to the drainage of the intradural spaces. This drainage is obtained by an extensive incision of the dura. According to our present experience, we should recommend four incisions, two on the middle cranial fossa, one between the sinus and the labyrinth, and one behind the sinus. Every incision should be $\frac{1}{2}$ cm. long; large blood vessels should be avoided in order to prevent hemorrhage.

By a simultaneous ventricle puncture the drainage of the cerebrospinal spaces is accomplished (Boenninghaus). Preysing's knives serve for the incision of the dura and the brain.

For a long time I have used knives 4 cm. long, sharp on both sides and provided with marks (5 mm.).* One of these knives is straight; the other is curved 45° on the angle, and the third 45° or the flat.

Of course, it is not necessary to make multiple incisions in all cases. The more we are convinced from the clinical symptoms and the operation findings on the ear that the meningitis is limited to a region easily accessible for surgical treatment, the greater will be the chances for the efficiency of a single incision in the region. Thus, for example, it is recommended to make the incision between the sinus and the labyrinth in sinus phlebitis and meningitis; with purulent labyrinthitis and clinical phenomena of a meningitis limited to the posterior cranial fossa (marked rigidity of the neck, abducens paresis, etc.) after the removal of the posterior wall of the petrous bone, one incision into the dura of the posterior cranial fossa will do. With localized disease of the tegmen tympani, accompanied by meningitis, the incisions should be above the tegmen. If at the same time we meet with extradural ichorous suppurative foci, we will have to avoid the ichorous parts of the dura and give preference to the more intact regions for the purpose of making the incision, provided we do justice to the chief requirement; i. e., that the incision should be made at that place where the meninges were first attacked by the otitic disease. If the bone and the dura seem unaltered and the latter is not under increased tension, we are sometimes (case 1) able to refrain from incising it.

In all cases the meningitis is combined with acute brain edema, which causes the brain surface to immediately bulge forward into the incision opening of the dura. If the edema is of a slight degree and the dura substance itself still intact, the gaping incision opening will hereby be closed. If the brain is mascerated, it will jut forward and sometimes in only a few seconds large prolapse will develop. With edema of slight degree the drainage may be made by introducing short sterile strips of gauze into the intradural spaces (Manasse).

The drainage of the intradural spaces is maintained by frequent changes of dressing. The first change may take place on the day the operation is made; however, during the first week we will, of course, have to limit ourselves to the renewal of the peripheral layers of the dressing; the strips of gauze

*To be had at Reiner's, Vienna, 1., Franzensring.

covering the wound cavity are only shortened, and, as to the rest, it is left in situ. A repetition of the lumbar puncture after two or three days is also recommended. Each time a quantity of 20 ccm. can be withdrawn without running any risk.

As to the prognosis, we can at this time hardly give any general information. It is certain, however, that two main factors are to be considered: (1) Whether any microorganisms are present, their kind, their virulence, and (2) whether by the meningeal changes at the time of operation we may recognize a topical relation with the auditory organ.

In regard to the first point as to the proof of microorganisms, reference is made to the material discussed herein. It is certain that every pathologic admixture of the liquor cerebrospinalis has to be considered as indicative of meningitis, and the mere presence of polynuclear leucocytes proves meningeal changes. If microorganisms are present at the same time, we have to deal with an infectious purulent meningitis, provided that we succeed in making the positive culture test. If the nutrient culture medium remains sterile, the finding of microorganisms in the stained specimen is not free from objections, for, in addition to contaminations and mistakes in examination, or bacteria in the reagent, non-viable microorganisms that accept strong stains may lead us to the microscopic diagnosis of an infectious meningitis, whereas an attempt to make a culture proves negative. It is also important to know that in some instances (especially in the initial stages) with infectious purulent or tubercular meningitis the lumbar puncture is found to be free of microorganisms. Only in later stages (after repeated lumbar punctures) we may succeed in such cases in demonstrating microorganisms. Testing the virulence is best made by experiments on animals after a positive culture test. The experiment on animals alone allows us to value and judge the case properly. Accordingly, the cases without microorganisms, or those with degenerated forms, are prognostically far more favorable than the infectious kind and especially those of great virulence. As regards the second point, i. e., the topical relation between the ear suppuration and the meningeal changes, frequently we can speak definitely at the operation. Those cases in which the purulent inflammatory changes extend from the ear to the intradural spaces prove to be the most favorable. In these cases we not

only have the certainty of the close pathogenic connection between the ear disease and the meningitis, but from a technical standpoint we are able to begin the operation at the correct location of the suppurative focus on the brain and to expose it sufficiently; i. e., over the limits of the pathologic changes. In such cases we are, of course, not certain whether there are no other seats of the disease on the dura, but it always means a good sign when we are able to establish during operation a localization of the meningeal changes in the region of the ear. If we cannot find such localization, the causes may be that it never existed, that we had to deal with a metastatic meningitis from the very beginning; i. e., with a diffuse meningitis. But even in cases where the meningitis developed by continuity through the extension of the purulent ear inflammation, we cannot expect that the contiguous tissues of the inflammatory region remain unaltered during the whole length of the disease. Pathologic changes of the bone, especially in the regions extending to the dura, will certainly furnish us a valuable indicator, but quite frequently we will find in an advanced stage of the disease only a trace or absolutely no pus in the ear itself and on the portions of the brain near the ear; the pathologic changes of the bone then give us the impression that pus must have been everywhere, but ruptured into the brain. It is clear that these latter cases prognostically are very unfavorable.

Also, those cases are not promising in which during operation the dural regions of the temporal bone are entirely unaltered and only slight changes are met with in the middle ear. In these cases when operating we frequently form the opinion that we have not to deal with an otitic meningitis at all, and it is certain that in some instances the differentiation of an otitic meningitis from a meningitis probably originating from the pharynx or the nose is exceedingly difficult if the examination of the ear shows the existence of a purulent, especially a chronic purulent, middle ear inflammation.

Finally, that form of purulent meningitis in which the intradural infection starts from multiple inflammatory plaques on the pachymeninges are unfavorable. This is a form of meningitis which is best illustrated by tubercular meningitis with caries of the base of the skull. In such cases we find within the ear region circumscribed or diffuse bone suppuration reaching to the dura. The removal of these suppurative foci,

however, appears to afford no relief, because, as we learn from the autopsy, on other places of the base of the skull (orbital roof, lamina cribrosa of the ethmoid bone, wing of sphenoid) corresponding bone changes have led to meningitis.

In this respect the middle ear is best to be compared with the vermiform process (Wicart). Wicart arrives at the conclusion that the fulminating course of so many cases of otitic meningitis depends on anatomic variations of the temporal bone consisting in circumscribed attenuation or atrophy of bone and must be taken into consideration in so far as the plates of bone by means of which the middle ear is normally isolated from the skull cavity, are attenuated or dehiscent. As to this view, which has been taken in regard not only to meningitis, but frequently also to other intracranial otitic diseases, my cases furnish little evidence. It may even be that a thick sclerosed bone plate furnishes a better protecting wall than a normal bone. As far as normal bone is concerned, we cannot judge a thin bone plate differently from a thick one, the thickness of which has chiefly been increased by diploetic of pneumatic spaces. A thin bone plate is always strengthened by the periosteum, and the spaces appear only as permeable spaces on the macerated specimen, while on the living body they are filled by connective tissues which in substance, i. e., as regards the lymph and blood vessels (upon which the extension of an inflammation chiefly depends) are the same as the bone. If, on the other hand, the bone is thick and contains much diploe, in consequence of the strong increase of the blood contents, the possibility of infection is increased. In case there are many pneumatic spaces, the danger of an inflammation resembling empyema will again arise and the great possibility of retention. We, however, must admit that every inflammatory process having its origin in the bone greatly endangers the dura on the bone, and we therefore can not simply speak of "dangerous, normal anatomic varieties of the temporal bone." On the other hand, we agree with Wicart, especially in regard to meningitis having a severe course, that the power of resistance of the patient and his state of nutrition are of greatest importance, and that in these cases chronic alcoholism blood and constitutional diseases (diabetes) will, of course, still more diminish the chances of recovery.

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ABSTRACTS FROM CURRENT OTOLOGIC, RHINOLOGIC AND LARYNGOLOGIC LITERATURE.

I.—EAR.

Preventive and Abortive Treatment of Mastoiditis.

W. SOHIER BRYANT, New York (*New York Medical Journal*, January 30, 1909), calls attention to the close relation anatomically of the ear and nasopharynx and the important role that the latter plays in causing infection of the ear and mastoid. His conclusions are as follows:

"The preventive treatment of mastoiditis should be directed to the nasopharynx and its preservation in normal condition. Preoperative treatment is a question of: (1) General systemic treatment with saline laxative and rest in bed; (2) the application of heat for the pain; (3) drainage of the middle ear; and (4) treatment of the nasopharynx. What he wishes especially to emphasize is that nasopharyngeal treatment is the treatment for prevention and abortion of mastoiditis."

Harris.

Thiosinamin in the Treatment of Deafness.

MAUPETIT AND COLAT (*Revue Hebdomadaire de Laryngologie, D'Otologie et de Rhinologie*, May 1, 1909) have conducted a series of investigations regarding the efficacy of thiosinamin in deafness along the lines conducted by Lermoyez and Mahu. They have confined its use to two classes of chronic deafness—to those cases of cicatricial otitis following suppuration of the ear where fibrous tissue has been thrown out, and, second, to cases of chronic adhesive otitis media of the dry variety, usually dependent upon affections of the nose and throat. They have employed thiosinamin in such case only after the use of inflation and massage of the drum have failed to give any further improvement to the hearing. They apply it locally and have endeavored to check their results by using iodid of potassium (one to one hundred) with sterile water in the other ear, where both ears were affected. As a result

of such investigations carried on in some thirteen cases, they are convinced that the drug has no therapeutic value in ear disease and in consequence its use has been abandoned in the clinic of Moure at Bordeaux.

Harris.

Deafness Following Febrile Diseases, and Its Prevention.

J. A. PRATT, Aurora, Ill. (*New York Medical Journal*, May 15, 1909). There seems to be little doubt that adenoids and enlarged tonsils are responsible for the majority of ear diseases. It is the mechanical obstruction to the Eustachian tube and the interference with the ventilation and drainage of the middle ear which causes the trouble. Where adenoids and tonsils are present, there are usually ear complications even in slight nasal congestion and practically always in febrile diseases, while in those free from these growths the ears are not affected in severe colds. Authorities disagree as to the presence of germs in the normal middle ear, but the author, from the common sense point of view, believes that they are, although the infection may spread from the nose and throat. He believes that germs forcing their way into the internal ear are often the cause of sudden internal ear deafness which has been attributed to toxins. Through ignorance and carelessness, the proper prevention of these troubles, the early and complete removal of all hypertrophied lymphatic tissue, is being neglected and, since so large a proportion of children have adenoids and enlarged tonsils, the time is coming when the State will take the matter into its own hands.

Harris.

Voluntary Rhythmic Nystagmus in Its Relation to Infections of the Vestibular Labyrinth.

PIETRI and MAUPETIT (*Revue Hebdomadaire de Laryngologie, D'Otologie et de Rhinologie*, January 23, 1909) have studied the symptom of voluntary nystagmus in a series of labyrinthine cases; first, where the diagnosis has already been made, and secondly, in cases of middle ear suppuration where a question of labyrinthine involvement was under consideration. They also carefully studied it in a series of deaf mutes. The results of their examination prove, on the whole, the importance of the symptom, and yet, in their

opinion, it is not impossible to put too precise and absolute value upon reflex nystagmus. Certain sources of error can occur. Among these are: First, that the nystagmus varies in certain professions to such an extent that one cannot, in these cases, make a positive diagnosis. Second, it varies also in certain individuals, particularly in those who are nervous and alcoholic, and these variations are very irregular and inconstant. In their opinion this is due to a lowering of the reflexes. Third, it varies with the age of the patient also in an irregular way. Finally it varies in individuals, and at times in the same individual in successive examinations made at intervals of several days.

Harris.

Hemorrhage of the Cavernous Sinus.

MOLINIE, Marseilles (*Revue Hebdomadaire de Laryngologie, D'Otologie et de Rhinologie*, June 26, 1909). A man of forty-three had suffered from suppuration of the right ear since infancy. When seen by Molinie, persistence of discharge and pain necessitated a radical operation, which revealed a small sequestrum in the roof of the attic. The patient was a man of bad habits. The convalescence was faulty, granulations soon followed and intense pain returned to the head. One night there was a hemorrhage. This phenomenon repeated itself every two or three days. The hemorrhage stopped spontaneously. The estimated loss of blood each time, according to the patient, was from one to two litres. Six weeks later a second operation was performed when the roof of the attic was found extensively necrosed, the osteitis extending to the roof and in part to the cerebellar wall of the antrum. There was no exposure of the lateral sinus or cerebellum. Much pain followed the operation in the region of the zone of the trigeminal nerve. Six days later a severe hemorrhage took place followed by another one in two days and death.

The autopsy showed a necrosis of the entire upper portion of the pyramid which had caused ulceration of the wall of the cavernous sinus, accounting for the repeated attacks of severe hemorrhage. Blood had burrowed underneath the dura and upper wall of the pyramid and thus escaped through the roof of the attic.

Harris.

The Modified Blood Clot After Mastoid Surgery.

SAMUEL McCULLAGH, New York (*New York Medical Journal*, June 13, 1908), is a strong believer in the modified blood clot method of inducing healing after the mastoid operation. He quotes Reik's well known views explaining how healing takes place in this method. The author employs only silk worm gut for suturing. A running subcutaneous suture is introduced and rubber tissue, properly folded, for drainage is placed between the last two stitches. This is allowed to remain from twenty-four to forty-eight hours. Care is necessary to avoid including any layers of skin in the suture. McCullagh believes that in this way infection is liable to occur. A certain rise of temperature after the operation is not, in itself, a sufficient cause for immediate removal of the suture. He does not regard any constitutional disease, with the exception of diabetes, as a contraindication. Only where an intracranial involvement exists should the method be avoided. He lays much stress upon the time saved in healing as well as the lessened discomfort to the patient. He believes that prompt healing will succeed, under proper diagnosis and in well selected cases, in seventy-five per cent of cases so treated. In spite of a number of complications, such as sinus thrombosis, that have occurred, he does not apprehend any evil consequences in cases where the clot breaks down.

Harris.

Sinus Thrombosis of Otitic Origin and Its Relation to Streptococchemia.

EMIL GRUENING, New York (*New York Medical Journal*, June 5, 1909), in a paper read before the New York Academy of Medicine, calls attention to the value of the examination of the blood in complications of middle ear suppuration. "In the last ten cases of thrombosis of the lateral sinus occurring in the otologic service of Mt. Sinai Hospital, blood cultures were made. In seven of these the result was positive and in three negative. The microorganisms causing the infection were, in five cases the streptococcus pyogenes, in one case streptococcus mucosus, in the other bacillus proteus. The same organisms had been previously found in the purulent discharge of the ear. The blood used in these cultures was

taken from the median vein before and after ligation of the internal jugular vein. Of the ten cases here grouped together, eight patients recovered and two died. One death occurred from meningitis in a case of the blood of which was reported negative, and the second death took place in the case infected by the bacillus proteus. These observations go to prove that blood taken from the veins of the arm will demonstrate the presence of the microorganisms in the general circulation more convincingly than the blood taken directly from the sinus." Furthermore the presence of the streptococcus in the blood does not necessarily lead to a fatal result but permits of a favorable prognosis. Gruening finally refers to the fact that a positive culture from the blood will aid in the diagnosis of sinus thrombosis where the objective evidences are lacking.

Harris.

Report of a Case of Cerebral Abscess With Masked Symptoms.

ROBERT EMMET COUGHLIN, Brooklyn (*New York Medical Journal*, April 11, 1908). The report of a fatal case of brain abscess illustrating the difficulty at times met with in arriving at a correct diagnosis. The patient was a woman of twenty-five who, when seen, had been complaining of headache in the right occipital and parietal region for two months. Once or twice there had been attacks of vomiting and vertigo. There was a history of pain in the right ear two years before. The eyes were found to be normal. The ears were examined and only a congestion of the right drum was found. A lumbar puncture was made but a dry tap resulted. There was a polynuclear count of eighty-six per cent. The temperature ranged from $99\frac{1}{2}$ to 101; for most of the time it was normal. The pulse rate ran from 82 on admission to 145 before death. In the presence of no localizing symptoms an operation was decided against and the patient died about two weeks after first being seen. The necropsy showed an abscess in the left side of the brain just external to the lateral ventricle. A connection existed with the right ear.

The author calls attention to the impossibility in this case of having discovered the abscess if the brain had been exposed in the locality of the pain complained of.

(The case is a most unusual one and, so far as we know, unique in that the abscess was located on the side oppo-

site the affected ear. Except for this not easily to be explained fact, there would seem to have been sufficient indication to trephine the skull in the region of the temporo-sphenoidal lobe.—Abstractor.)

Harris.

Indications for Operation in Acute Mastoiditis.

ERNST DANZIGER, New York (*New York Medical Journal*, June 26, 1909), is of the opinion that there is such a thing as sound conservatism in deciding when to operate for acute mastoiditis. He points out that in inflammation of the middle ear, the inflammatory process is not limited to the middle ear, but the mucoperiosteum of the antrum and mastoid cells participate to a greater or less degree and that it is only later that a true pathologic change takes place here, which is in the nature of an osteitis followed later by a thrombophlebitis of the smaller veins of the mastoid. He argues that inasmuch as the middle ear disease is usually secondary to an affection of the nose and throat, we should expect to find the temperature typical of the original disease. When the middle ear is involved the temperature should become higher and assume a septic aspect. After the performance of paracentesis of the drum, the temperature will assume the typical picture of the original disease. Reasoning from this and the fact that the physiologic edema and the mucoperiosteum of the drum will cause retention and resorption, we should regard the continuation of the fever as no indication in itself for operation. Only when fluctuation occurs with chills and sweats is there a distinct indication for operation. The presence or absence of a rise in temperature is not an absolute indication for surgical interference. Pain over the mastoid antrum and tip of the process is characteristic of all acute affections of the middle ear and usually disappears after proper drainage of the tympanum. Only when it persists or becomes more severe and boring, especially at night, are we to assume that necrosis has taken place. An increase in the amount of the discharge from the middle ear with a change in its character and the sinking of the upper posterior wall of the canal are also important indications for operation.

Harris.

**A Contribution to the Pathology of the So-Called Circumscribed
Otogenous Meningitis.**

ENGELHARDT (*Deutsch medicinische Wochenschrift*, February 25, 1909). Körner's recent investigations would seem to show that a circumscribed purulent meningitis is not as common as was formerly believed.

It is a question whether anatomically a circumscribed meningitis occurs as frequently as the clinical diagnoses appear to prove.

Even the cases of Gradenigo, in which clinically the symptom complex, acute inflammation of the middle ear, persistent pain in the temporal and parietal regions and paralysis of one or both abducens nerves—as a rule without involvement of other cranial nerves—was present, were not proved anatomically.

The inspection of the exposed dura, without an incision through it, is not sufficient to make a diagnosis of a suppurative meningitis.

Manasse in his work "The operative treatment of otitic meningitis," states that when symptoms of meningitis are present, the suppurative process in the mastoid should be cleaned out and the dura exposed, and unless extradural abscess, sinus thrombosis or brain abscess are complications, a waiting policy should be followed out.

In a case reported by Grossman, however, in which the bone was healthy, the exposure of the dura was followed by a secondary infection of the sinus, a complication that could have been avoided.

He also reports another case with fully developed symptoms of meningitis: vomiting, rigidity of the neck, facial paralysis and cloudiness of the fluid obtained by puncture, which entirely cleared up after the mastoid operation, without exposure of the dura or lateral sinus.

The author reports the following interesting case: A young man aged 25 years, was operated upon five years before coming under his observation, for mastoiditis, and had been apparently in good health up to March 10, 1908. Then he developed pain and discharge in the same ear with inflammation of the old cicatrix and tenderness on pressure. There was a right-sided abducens paralysis. At the operation a large cholesteatoma, which had destroyed part of the labyrinth, was found.

The dura of the middle fossa was not exposed. On the

following day there was some rigidity of the neck, retracted abdomen and headache. Pupils were contracted, and there was double vision and a right-sided abducens paralysis. Kernig symptom absent.

The patient made an uninterrupted recovery without exploration of the brain. The author comes to the following conclusions:

1. In purulent circumscribed meningitis there is anatomically perhaps first a diffuse leptomeningitis.

2. Even when intracranial complications are suspected an exposure of the dura is not always advisable in performing the mastoid operation, in fact in some cases it is contra-indicated.

Theisen.

Clinical Investigations on Disturbances of Equilibrium of Labyrinthine Origin With Especial Reference to the General Methods of Examination and That by Means of the Goniometer.

GEORGE W. MCKENZIE (*Archiv. f. Ohrenheilkunde*, Vol. 78, Nos. 3 and 4). The relation of disturbances of equilibrium to disease of the labyrinth has been somewhat in doubt. Certain observers have been of the opinion that such irregularities went hand-in-hand with the cardinal symptoms of vertigo and nystagmus, disappearing when the latter disappear; others have regarded them as dependent upon meningitis or general weakness; still others that they were of meningeal origin; while certain careful observations have pointed to their labyrinthine origin. With the aim of arriving at some definite conclusion, McKenzie has carried out a series of careful investigations covering a number of months and representing the repeated examination of over thirty cases of labyrinthine disease by means of the various functional and caloric methods and by the goniometer. He has, for this purpose, made use of the apparatus modified by Alexander, the patient being carefully instructed in the proper position of holding the knees and standing erect. The feet are bared for the test and covered with powder. As a result of his investigations he has found that disturbances of equilibrium bear no relation to the degree of vertigo and nystagmus and persist after the latter have disappeared. His results in the examination of normal ears are quite in line with those of von Stein. The normal case shows, after the first or second examination,

no equilibrium disturbance by Romberg, or the forward or backward bending, or by hopping, nor on the goniometer, up to an angle of about thirty degrees, except in about five per cent of cases where hysteria or excessive nervousness was shown, and even in these cases after a time the usual results were obtained. McKenzie made his tests on cases from six to eighteen months after the onset of the disease. As just stated, in all these cases nystagmus and vertigo were not present, yet disturbances of equilibrium persisted. This was especially noticeable where both labyrinths had been involved. From this the author concludes that incoordination cannot proceed from the semicircular canals but that disturbances of incoordination must depend upon the end organs of the vestibule, namely the macula utriculi and the macula sacculi. Among the conclusions which he draws from the use of the goniometer are: First, that disturbances of equilibrium can be exactly shown; second, that in cases of acute disturbances of equilibrium the angle of inclination corresponds to the grade of disturbance; that is to say, in cases of pronounced acute disturbance only a small degree of inclination can be arrived at; third, that the examination by means of the goniometer allows us only to determine in regard to the disturbance of incoordination as such; whether it is of labyrinthine origin or not can only be determined by other methods of examination.

Harris.

Clinical Studies on the Functional Examination of Labyrinthine Disease by Means of the Galvanic Current.

GEORGE W. MACKENZIE (*Archiv. f. Ohrenheilkunde*, Vols. 77 and 78). These studies covered a period of eleven months. The galvanic current in the examination of the inner ear has, in the past, been of scientific rather than general value. It is necessary for it to be used for each ear by itself. The author has employed it by a method of his own in a large number of cases both with normal and diseased labyrinths. He makes use of a ball electrode which he places upon the temporal bone of the ear to be examined. The other electrode, a flat plate, four to five centimetres in length, is held in the patient's hands. An assistant to take charge of the motor is desirable. The patient is instructed to fix his glance on some object upon

the wall a short distance over the head of the examiner, who wears a head light for the purpose of detecting the nystagmus. The current is gradually increased until a positive reaction is obtained. It is then gradually diminished and the electrodes are changed. This procedure is followed for both ears. In certain cases the opening of the current produces nystagmus and vertigo. The nystagmus produced in this way is compared with that obtained by the closing of the current. This fact has lead Mackenzie to compare the nystagmus in all cases of the current opening and the current closing.

He gives in detail the result of the functional examination of thirty cases of unilateral labyrinthine disease occurring in patients seen in the Allgemeine Polyclinic in Vienna. From the analysis of these testings he draws certain important conclusions in regard to its availability for detecting disease of the labyrinth.

In the healthy ear the galvanic reaction of the kathode and anode ranges from one and a half to seven milliamperes or an average of four milliamperes. In the same individual there was never more than a difference of one milliampere between the two ears. Cases of unilateral labyrinthine destruction had the following points of differentiation in common: (1) The history gave at least one attack of typical, violent vertigo. (2) All cases showed more or less violent nystagmus of greater intensity towards the sound side. (3) All cases showed inactive caloric excitability of the diseased labyrinth. (4) All cases showed a higher grade of diminution of the nystagmus toward the diseased side when placed on the turning stool as compared with the labyrinth of the other side. (5) All cases showed an equal degree of diminution of the galvanic nystagmus towards the diseased side, the galvanic excitability of the diseased side being diminished compared with the normal or healthy side. In a few cases it was not possible to use a sufficiently strong current for the kathodal test on the diseased side or the anodal test on the healthy side, since the patients became restless when seven or eight milliamperes were employed. In the remaining cases it was necessary to use from fourteen to sixteen milliamperes in order to get a positive reaction.

The result of the examination of the cases of unilateral labyrinthine destruction gave the following conclusion:

(1) From the fact that unilateral destruction gives a positive reaction on this side it follows that the vestibular nerve is not attacked, or at least its conducting power is preserved. (2) In cases in which, in order to obtain a kathodal reaction, it is necessary to employ a current two or three times stronger than on the diseased side, we must assume that the static nerve ends are not functioning. (3) From the evident diminution of the kathodal reaction upon the diseased side, we must conclude that the galvanic reaction in the normal ear is given by the nerve end organs and by the nerve ends themselves. It is clear, therefore, in cases of destruction of the labyrinth, that to bring about a distinct kathodal reaction a much stronger current must be used than if the organ be intact. As regards cases of unilateral labyrinthine disease with pathologically increased excitability, the following common symptoms were obtained: (1) History in all cases of subjective noises and attacks of vertigo. (2) All cases give evidence of positive reaction upon the diseased side. (3) In all cases diminution of nystagmus in being placed upon the turning stool as compared with the normal and healthy ear. (4) In all cases cardinal labyrinthine symptoms were present—difficulty of hearing with shortened bone connection; lowering of the upper tone limits. (5) Disturbance of the equilibrium as shown especially by the goniometer. (6) All cases were alike in that upon the normal side anodal reaction was produced by a weaker stream than by the kathodel. The author concludes from these findings that the galvanic reaction represents a very valuable quantitative reaction for the static labyrinth and is especially important in unilateral disease with pathologically increased excitability; better, indeed, than upon the turning stool when the differential diagnosis between the normal condition and that of the increased excitability produced by disease is so small that it cannot be made out.

Harris.

Etiology of Acute Otitis.

NEUMANN and RUTTIN, Vienna (*Archiv. f. Ohrenheilkunde*, (Vol 79, parts 1 and 2)), have examined ninety-one cases of acute otitis with reference: First, to whether the epi- or mesotympanic situation of the suppuration has an influence upon the course of the disease, and especially whether one

of these localities leads constantly, or in the great majority of cases, to purulent otitis, or whether this is due to other causes; second, whether one particular excitant oftener than others gives rise to acute mastoiditis, or whether this also is dependent on other causes. The bacteriologic examinations have been carried out with the utmost care to get pure cultures, and the methods employed by them are carefully described. In cases where the drum membrane has not spontaneously burst, the paracentesis was made with a small glass rod. In only a few cases was it necessary, on account of the thickness of drum, to use a paracentesis needle.

In the table, mixed cultures are regarded only as such from a pure bacteriologic standpoint. They represent seven cases. Of the cases which were examined, representing ninety-seven ears, forty-three came to operation, of which seven had an epi- and thirty-six mesotympanic perforation. Fifty-four healed spontaneously; of these eleven were epi- and forty-three mesotympanic suppurations. The answer, then, to their first question is that the occurrence of an acute suppuration of the mastoid is not dependent upon the locality of the suppuration in the middle ear. In regard to the second inquiry—whether the character of the pus has an influence in causing acute purulent mastoiditis—they found fifty-four cases healed without operation; three were "kapsulkokki otitides" and fifty-one were cocci otitides produced by an excitant without capsule. Of the forty-three cases which came to operation, fourteen showed "kapsulkokki otitides" and twenty-nine capsule free microorganisms. We see, therefore, that otitides caused by capsulated cocci have a higher percentage and, therefore, more frequently lead to mastoid and cranial complications than capsule free microorganisms.

These agree with the previous investigations by them of ninety cases. The smaller number of "kapsulkokki otitides" is to be noted. This is at variance with Supfle, who, however, included a number of children in his studies. The authors call attention to the fact that on account of the difficulty in making pure cultures in children, they have excluded all children under four years of age, who, it appears, are more liable to "kokki otitides" and, because of the still present bone fissure mast, periosteal abscess is more likely to form. Of the "kapsulkokki otitides," the

streptococcus mucosus in pure culture in eighteen cases examined by them out of which sixteen came to operation; only two healed spontaneously. These findings are at variance with the common opinion of the malignity of the streptococcus pyogenes aureus. As regards its power for producing mastoid complications, of the thirty-four cases of streptococcus infection, twenty healed spontaneously, and only fourteen came to operation. In the authors' opinion the anatomic form of the mastoid is of more importance than the character of the infection in the production of acute mastoiditis. In most of the cases where severe bone complications resulted, they were able to demonstrate the existence of the pneumatic form of mastoid. Every acute otitis is an inflammation of all the pneumatic cells of the temporal bone and gives rise in these cells to an exudate which is an excellent breeding place for bacteria. It can easily be seen that a sclerotic mastoid would be less liable to cause an extension of the disease.

They admit regretfully that our present methods of examination fail to detect the pneumatic mastoid, but the presence of spontaneous pain over the mastoid in acute otitis in the course of the first few days they feel should make one suspicious of such a condition. This pain soon disappears when the inflammatory process in the mastoid disappears, but returns when the simple inflammation of the mastoid changes into an empyema.

While the character of the infection is of less importance than the anatomic formation of the mastoid in producing an acute mastoiditis, it has an influence on the course of the disease. While they found it impossible to indicate particular cocci, they were able to determine, with reasonable satisfaction, that the "kapsulkokki" have a much more virulent effect than the capsule free cocci.

In comparing these two groups they found that the course of an acute otitis as regards the development of the mastoid complication forms, in the case of the capsule free cocci, a crescendo curve, while in that of the "kapsulkokki" the curve was a descending one, and after a long interval again rose. With the streptococcus mucosus there was an entirely characteristic picture. Such an otitis can spontaneously heal, but there was little tendency for a permanent healing, and it appears that cases formerly regarded as primary mastoiditis were in reality due to an otitis of

streptococcus origin. Characteristic of such an otitis is the receding of the inflammation in the middle ear in the first or second week, the continuance of considerable difficulty with the hearing, for the most part associated with subjective noises and appearance of the drum membrane which suggests a secretory catarrh. The general contour is still recognizable but the details and the sharpness of the light reflex are not sharply defined; there is no pain, only a minimum amount of tenderness. Of their cases, two had extradural abscess, one meningitis, one brain abscess and five Bezold abscess. The symptoms can be extraordinarily light so that the patient does not go to the physician. The histories of fourteen cases are given illustrating the peculiar character of this infection.

Of the capsule free cases, the streptococcus pyogenes aureus produces a fairly characteristic otitis. There is a sudden painful onset followed by symptoms of redness, bulging of the drum, pain on pressure over the mastoid and fever which is soon succeeded by a spontaneous rupture of the drum, giving rise to a sero-bloody secretion. From this stage the otitis goes on without any complication to prompt healing, or in some cases acute mastoiditis develops. Their opinion that the streptococcus pyogenes aureus has no particular malignity in producing mastoiditis is confirmed by the fact that five of the cases of streptococcus infection examined by them had double sided otitis where the condition did not vary. These cases were all dependent on influenza. All five cases had a central perforation and healed spontaneously without operation.

Harris.

II.—NOSE.

A Case of Accessory Sinus Disease With the Symptoms of an Osseous Tumor of the Orbit.

BURTON CHANCE, Philadelphia (*New York Medical Journal*, March 14, 1908). The patient was a lad of fourteen who showed a hard bulging mass in the right orbit pushing the eye outward and downward. The tumor was not sensitive to deep pressure. There was no obstruction or discharge from the nose or throat. The accessory sinuses were not examined. A diagnosis was made of an exostosis of the orbit. The operation revealed a closed cyst of the ethmoid filled with thick

mucus. The cavity extended back to the sphenoid and up to the frontal sinus. An opening was made into the nose. A prompt recovery followed the operation.

Harris.

Pathogenesis and Treatment of Ozena.

LAVRAND (*Revue Hebdomadaire de Laryngologie, D'Otologie et de Rhinologie*, July 17, 1909) calls attention to the widely varying views regarding the etiology of ozena and also to the unsatisfactory methods of treatment generally employed. Of these the use of paraffin locally has seemed to give the best result. In his opinion, however, this is an illogical form of treatment, and in his hands it has failed to give as good results as others have obtained. In a study of cases of ozena where no treatment has been instituted, he has always been impressed that the secretions have proceeded from the region of the middle meatus. Acting upon this suggestion, he has carefully probed the middle meatus and has always found signs of an osteitis of the ethmoid shown by a sensation of denuded bone. The extent of the osteitis is in proportion to the abundance of the discharge and the intensity of the odor. An exception to this observation he has yet failed to meet. Where there is a unilateral osteitis, the ethmoid upon the healthy side has always been normal. The histories of a number of cases are given where an ethmoiditis has been discovered and, after operation, the ozena symptoms have been relieved. In the author's opinion, then, in all cases of true ozena we have to do with necrosing ethmoidal osteitis demanding surgical intervention.

Harris.

The Treatment of Suppuration of the Accessory Sinuses of the Nose.

HÁJEK (*Archives Internationales de Laryngologie, D'Otologie et de Rhinologie* January-February, 1909) places a great deal of importance on the general treatment of the acute affections of the accessory sinuses. In all cases of sinusitis depending upon acute colds or influenza, he is wont to obtain speedy cures by means of sweating through the use of aspirin in fifteen to thirty grains. He continues this for three or four nights in connection with dry friction twice a day of the whole body. He also is a firm believer in the value of a change of climate in effecting a speedy cure. The particular climate does

not seem of as much importance as a change from the climate in which the disease developed. In the treatment of chronic cases of frontal sinus, Hajek is able to effect a cure in many instances by intranasal measures. He practices resection of the middle turbinate, removing it at its extreme anterior portion from the agger nasi with curved scissors, in this way laying open the infundibulum. Where this does not succeed in effecting a cure in a reasonable time, which means in some cases months or even years, he practices the external opening according to the Killian method. He does not favor the primary closure of the external wound, regarding it as the cause of the frequent failures in this operation. He condemns the osteoplastic operation because of the many cases of recurrence.

Diseases of the ethmoidal labyrinth demand exenteration intranasally. Only in cases where the extreme anterior cells are involved is it necessary to do the external operation. He urges the importance of careful cocaineization of the operative field before beginning the operation, removing only such portions of the disease at a single seance as the patient can endure and the application after the final operation to the granulations which spring up of three to ten per cent of nitrate of silver.

As regards the treatment of the sphenoid, he does not attach a great deal of importance to the lavage nor to enlarging the osteum because of its tendency to close. He believes that the greatest relief will be had in the thorough removal of the middle turbinate and ethmoid and the anterior wall. To do this, he uses either his hook or one of the several models of cutting forceps or the electric trephine.

Harris.

III.—LARYNX.

A Plea for Systematic Use of Bronchoscopy in Our Routine Work.

WOLFF FREUDENTHAL, New York (*New York Medical Journal*, May 23, 1908) gives a description of a bronchoscope jointed two and one-half inches from the end. In the author's opinion, the use of such a form of instrument greatly facilitates the ease of introduction and overcomes the difficulties encountered with Jackson's solid tube. For purposes of illumination, he uses a light carrier similar to that used in the Jackson instrument.

Harris.

New Contributions to Laryngotracheostomy.

MELZI and CAGNOLA (*Archives Internationales de Laryngologie, D'Otologie et de Rhinologie*, March and April, 1909) report three additional cases operated upon successfully by laryngotracheostomy. They all occurred in children of eleven years or under and were, in each instance, the result of diphtheria.

The stenosis in the first case took the form of a general atrophy in the size of the larynx, due to the prolonged intubation. There was a general narrowing of the passage, but no spot of cicatricial deformity.

The second case showed a thick cartilaginous growth, which was removed by the Hartmann conchotome, which they recommend as especially indicated for this purpose. The result in this and previous cases reported by them render them very enthusiastic for this form of treatment for stenosis of the larynx. In place of the gutta serena recommended by Killian, Prof. Ferreri uses compressed cotton, known in this country as a Bernay's sponge, and the authors employ a tampon of hard wood covered with iodoform gauze, which is cubically shaped above and grooved below to conform to the tracheal cannula to which it is attached. They urge never to lose sight of the operative field and never to leave any portion unpacked.

Harris.

Some Experiences in the Direct Examination of the Larynx, Trachea and Esophagus.

A. BROWN KELLY (*Journal of Laryngology*, June, 1909) states his object in this paper to be "to indicate the possibilities of endoscopy of the lower air passages and esophagus and the desirability of making a routine use of the method."

He has used the Rosenheim tube for esophagoscopy and the Killian for bronchoscopy, but of late has found the Bruening telescopic tubes available for both. He has tried various methods for lighting.

Most of his examinations and operations have been conducted with the patient recumbent and under chloroform. He describes certain of his examinations, showing how the direct method has facilitated correct diagnosis in many cases. In children and unduly sensitive adults, the direct method renders certain operative procedures much easier.

In the past tracheoscopy and bronchoscopy have been chiefly employed for the removal of foreign bodies, but Dr. Kelly has found them of much assistance in discovering the cause in stenosis of the trachea and bronchi.

He believes that the routine use of the direct method may lead to the detection of malignant diseases at a stage before they become inoperable. He, himself, has investigated a number of growths at various depths in the esophagus and in some instances has removed fragments.

By the employment of esophagoscopy he has been able to discover the cause of the dysphagia in several cases which undoubtedly would otherwise have been classed as hysterical.

Harris.

Fulguration and Laryngotomy in Cancer of the Larynx.

LAURENS (*Archives Internationales de Laryngologie, D'Otologie et de Rhinologie*, January-February, 1909) reports two cases of laryngeal cancer treated by the method of Keating-Hart. The report is confessedly of little importance as regards the permanent value of the operation, inasmuch as they were performed only a month before the report was made. The author gives a detailed account of the operation and the laryngoscopic appearance afterward.

In both cases the disease was a limited one. The author describes the various steps of the laryngotomy, calling attention to the necessity of employing, as far as possible, only instruments made of glass. He then enumerates the different post operative phenomena seen in the larynx, which were: First, a moderate edema of both arytenoids lasting for thirty-six hours, more pronounced on the fulgurated side; second, intense erythema; third, a fibrinous eschar which was spontaneously thrown out on the fourth to the sixth day without any hemorrhage through the tracheal orifice; fourth, hypersecretions from the larynx, first mucous and then muco-purulent; fifth, ecchymosis of the lateral wall of the larynx; sixth, a laryngeal picture suggesting the destruction of the healthy vocal cord. The convalescence was rapid in both cases and Laurens is enthusiastic for the method, not only in cases of limited disease, but also in cases where the neoplasm has extended widely into the neighboring tissues. He concludes by giving a careful account of the technic employed in the fulguration, as described by Keating-Hart, and which is now

practiced by himself representing two steps: First, the macroscopic removal of the growth without any attempt at its entire obliteration and of the surrounding glandular tissue; second, the fulguration practiced from five to ten minutes under chloroform anesthesia reinforced by applications of cocaine to prevent undue movement of the larynx.

Harris.

Treatment of Four Infants Suffering from Papilloma.

VAN DEN WILDENBERG (*Archives Internationales de Laryngologie, D'Otologie, et de Rhinologie*, March and April, 1909). For removal in these cases the author has successfully employed the intralaryngeal method by means of the Killian tube spatula. The ages of the first three children were seventeen and eighteen months, and of the fourth child eight years. General anesthesia was employed. The greatest difficulty presenting itself was the form of the epiglottis, which at that age is very small and not easily controlled. Local anesthesia is not recommended on account of the great fatality wont to follow its use in children of such a tender age. The author does not use adrenalin, checking the hemorrhage entirely by compression.

In the second case, where the larynx was found completely filled with the papilloma, cyanosis occurred during the removal of the growth and a tracheotomy was necessary. The operation was continued the following day, when the larynx was found free. Two days later masses were seen below the cords, which were removed.

In the third case, no anesthesia was employed at the first three operations, when papilloma were removed, but a general anesthetic was given for the removal of the papilloma situated in the angle of the cricoid. Soon after roughness of the voice returned. Two months later intense dyspnea showed a pronounced recurrence and tracheotomy was then performed. For six months the papilloma were removed from time to time intralaryngeally. The child died later of convulsions. The autopsy showed the respiratory tract below the cannula perfectly normal. It demonstrates the uselessness of our interference as regards the cure of papilloma in this case. The larynx was covered with a profuse mass of papilloma extending to the tracheal opening. He does not recommend the method employed here except in cases of very young children who can be easily held, and only for the removal of papilloma

situated in the upper larynx. He advises the removal of only a few at a time and keeping the field well in view. The introduction of the tube spatula is wont to cause a fit of crying with a spasmodic closing of the larynx, which will be followed by a deep inspiration opening wide the larynx. The sitting position favors the avoidance of wounding the mucous membrane. There is usually no reaction and the procedure can be repeated two days later.

The fourth case was that of a child of eight, who had for over four years worn a tracheotomy tube because of papilloma in the larynx, which had been removed at the time of the tracheotomy. Here laryngotomy was performed.

Harris.

IV.—PHARYNX.

Acute Unilateral and Recurring Hypertrophy of the Tonsils.

MUNCH, Paris (*Revue Hebdomadaire de Laryngologie, D'Otologie et de Rhinologie*, February 13, 1909), reports a case of a child operated on by morcellement at four years of age for adenoids and enlarged tonsils and twice afterwards at intervals of two and three years for acute and unilateral hypertrophy of the left tonsil. A careful histologic examination was made of the tissue removed and, in spite of suspicion of malignancy, the findings showed nothing but the ordinary picture of hypertrophied tonsil tissue. The author comments upon the rarity of the occurrence and quotes a similar case reported by Lavrand.

Harris.

Two Cases of Syphilis of the Nasopharynx.

TRAPENARD, Menton (*Revue Hebdomadaire de Laryngologie, D'Otologie et de Rhinologie*, January 30, 1909). The report of two cases occurring in children of eight and ten years respectively where the nasal obstruction was of recent date. The soft palate showed marked engorgement, one case with a tendency to perforation. Hutchinson teeth were present in the younger child. The growth in the nasopharynx was soft to the touch. Both cases recovered promptly under specific treatment.

The author is of the opinion that syphilis of the nasopharynx in children is not as uncommon as is usually thought. The difficulty of diagnosis leads him to advise that where the

respiratory trouble is of short duration, we should always bear in mind the possibility of syphilis, even where it resembles the ordinary adenoid growth.

Harris.

Neurasthenia in Its Etiologic Relation to Nasopharyngitis.

ROYET, Lyons (*Archives Internationales de Laryngologie, D'Otologie et de Rhinologie*, January-February, 1909), is of the opinion that many symptoms usually ascribed to neurasthenia are dependent upon disease of the nasopharynx localized in the fossa of Rosenmueller. He calls attention to the anatomy of this fossa and its liability to inflammation and thus becoming a closed cavity retaining secretions. He also refers to the structures lying in close proximity as capable of causing many of the symptoms which he enumerates, such as headache, mental asthenia, nasal hydrops, nervous coughs; referable to the ear: subjective noises, deafness, hyperacusis, vertigo and inco-ordination of gait, muscle anesthesia and sensation of "casque." This latter symptom is often associated with headache and is met with in ear diseases which have their origin in the nasopharynx. Of general symptoms depending on nasopharyngitis, he names insomnia, tachycardia, digestive troubles, neuralgia and motor and sensory affections of the throat.

Harris.

Ulcer of the Palate of Streptococci Origin.

JACQUES (*Revue Hebdomadaire de Laryngologie, D'Otologie et de Rhinologie*, July 10, 1909). The ulcer occurred in an adult laboring man of thirty-eight and, when seen, was of about a month's duration. There was a complaint of constant pain in the throat, not benefited by gargles. The ulcer was situated at the base of the epiglottis. It had rounded borders and a diameter of about a franc piece. It was not covered with detritus, showed considerable vasculature, had a vermilion tint and presented a loss of substance of from ten to fifteen millimeters, but blended gradually with the healthy mucosa of periphery. There was no other lesion in the neighborhood, neither of the tonsils nor gums, no enlargement of the glands. The application of iodid of glycerine and potassium iodid internally, on the supposition that it was of mycotic origin, gave satisfactory results, and in the course of a month the ulcer was healed.

An extensive bacteriologic examination was made, which showed a microbe reported by Klava some years ago and described by him as *leuconostoc hominis* resembling in many ways the *streptococcus pyogenes*.

Harris.

Three Cases of Primary Gangrene of the Pharynx. Cure in One Case by Injection of Anti-Streptococcus Serum.

CITELLI (*Archives Internationales de Laryngologie, D'Otologie et de Rhinologie*, January-February, 1909). The first case was that of a young woman, twenty-five years old, of excellent health. Eight days before seen by Citelli, she noticed two small white spots on the tonsils, which gradually extended, giving rise to only a little difficulty in swallowing. When seen by him, the patient was clearly septic—breath very offensive, pronounced glandular enlargement. On examination of the throat, the two tonsils could no longer be recognized; in their place one saw a lardaceous colored mass, which gave rise to an unbearable odor. In spite of the use of antiphtheretic serum and of local and general treatment, the disease gradually extended and the patient died fifteen days after the onset of the disease.

The second case was a child of eight years, where the picture of the disease was similar to that in the first case. Here local disinfectants seemed to have the happy effect of limiting the necrosis to the affected tonsil, but twenty days later the same phenomenon broke out in the other tonsil and the child died.

In the third case, a man of thirty, Citelli was able to effect a cure with one injection of antistreptococcus serum.

He emphasizes the well-known gravity of this disease and urges the discovery, if possible, of the particular germ which is the cause and combating it by the use of a suitably prepared serum.

Harris.

Digital Enucleation of the Faucial Tonsil. The Otitic Significance of Tonsillectomy With Reference to Digital Enucleation.

A. MORGAN MACWHINNIE, Seattle, and H. P. BLACKWELL, New York (*New York Medical Journal*, May 29, 1909). The interest which at present is being shown in the procedure for the removal of the faucial tonsils is seen in two papers on

digital enucleation by men living at widely removed distances. Dr. MacWhinnie advocates the employment of the index finger for the complete removal of the tonsil without the aid of any instruments. He works under general anesthesia and claims for the method "simplicity, rapidity, safety and thoroughness." The essential point in his method is carrying the finger "outside the capsule in the posterior inferior portion of the sinus, working up to the supratonsillar fossa." The same procedure is carried out posterior to the anterior pillar. He states that the bleeding is very slight and the reaction insignificant.

Blackwell, instead of depending upon the finger entirely, first separates the attachment of the tonsils to the anterior and posterior pillars by means of a Leland knife. The left index finger is then introduced into the supratonsillar fossa and each tonsil is gently shelled out of its bed. He stops short of complete removal in this way, leaving the tonsil attached at its inferior pole. The operation is then completed by means of the cold wire snare.

Harris.

V.—MISCELLANEOUS.

Positive Proof of Adrenalin Reaction of Meltzer and Loevi in a Case of Accidental Section of the Sympathetic and Pneumogastric Nerve.

BRINDEL, Bordeaux (*Revue Hebdomadaire de Laryngologie, D'Otologie et de Rhinologie*, April 24, 1909) has demonstrated that the pneumogastric is the regulating and the sympathetic the accelerating nerve of the heart. Injury to the pneumogastric and section of the sympathetic produces a slowing of the pulse, diminution of the pupil and a shrinking of the eyeball. Meltzer and Loevi have found that adrenalin introduced into the healthy eye has no effect, but put into the eye of an animal where the superior cervical sympathetic has been removed, a mydriasis was at once produced and myosis resulted after section of the nerve. - Brindel has recently seen a case of a man who had received a wound of the neck. When seen by him thirty-three days after the accident, a complete paralysis of the left vocal cord was noted. The characteristic diminution of the size of the left eyeball was to be detected, and the left pupil was much smaller than the right. There was no tachycardia. In the presence of such symptoms, a diagnosis was made of a section of the pneumogastric and

sympathetic nerves, and it was possible to confirm the experiments of Meltzer and Loevi of the effect of adrenalin in such cases.

The author concludes by commenting upon the rarity of the simultaneous section of the pneumogastric and sympathetic nerves, having been able to find but three probable cases in the literature.

Harris.

The Physiologic Action of Strong Cocain-Adrenalin Solutions.

JOHN LESHURE, New York (*New York Medical Journal*, February 6, 1909), in a carefully prepared article, takes up the relative absorption of the common solutions of cocain and adrenalin used in nasal surgery. "Both cocain and adrenalin have the power of contracting superficial and deep vessels, but the degree and rapidity of this contraction seems to be proportionate to the strength of the drug solution used." Strong solutions are seen to do it promptly, as any solution is rapidly diluted by the copious mucous exudate. By a strong solution, the author means one made by dissolving a gram of cocain hydrochlorid in a cubic centimetre of a one to one thousand solution of adrenalin chlorid. This solution represents fifty-five per cent by volume and has a specific gravity of 1.110. As he rightly says, we should seek to bring the solution to the vessel walls and anesthetize the vasomotor fibers, but not allow it to pass through them. He shows that with the ordinary solution (from four to twenty per cent), we have a specific gravity of only a little over a thousand. He also calls attention to the law of fluids, that absorption is in inverse proportion to the density of the fluid. From this, he logically reasons that the light solutions of common use are much more liable to become absorbed into the system than the heavy solution employed by himself. Such a clear physiologic explanation of the toxic effects of cocain and adrenalin, in view of the accidents occurring from their use, is most timely. The solution is applied upon a cotton applicator to the part of the nose to be operated upon. A few wipings at intervals for ten to fifteen minutes will produce complete anesthesia.

Harris.

